WIRE AND WIRE PRODUCTS

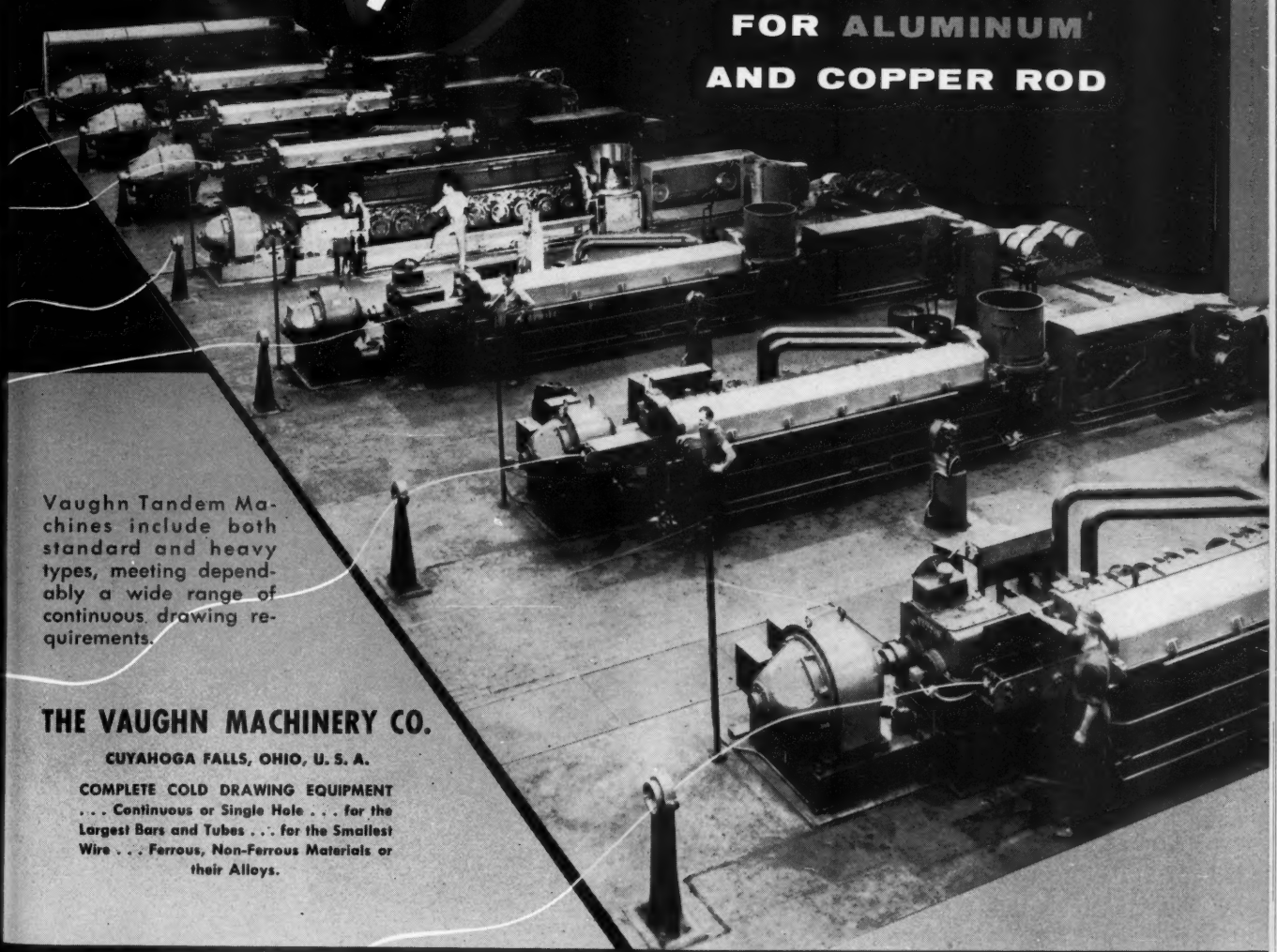
SEPTEMBER 1955

Vaughn®

TANDEM MACHINES

"Quick on the Draw!"

FOR ALUMINUM AND COPPER ROD



Vaughn Tandem Machines include both standard and heavy types, meeting dependably a wide range of continuous drawing requirements.

THE VAUGHN MACHINERY CO.

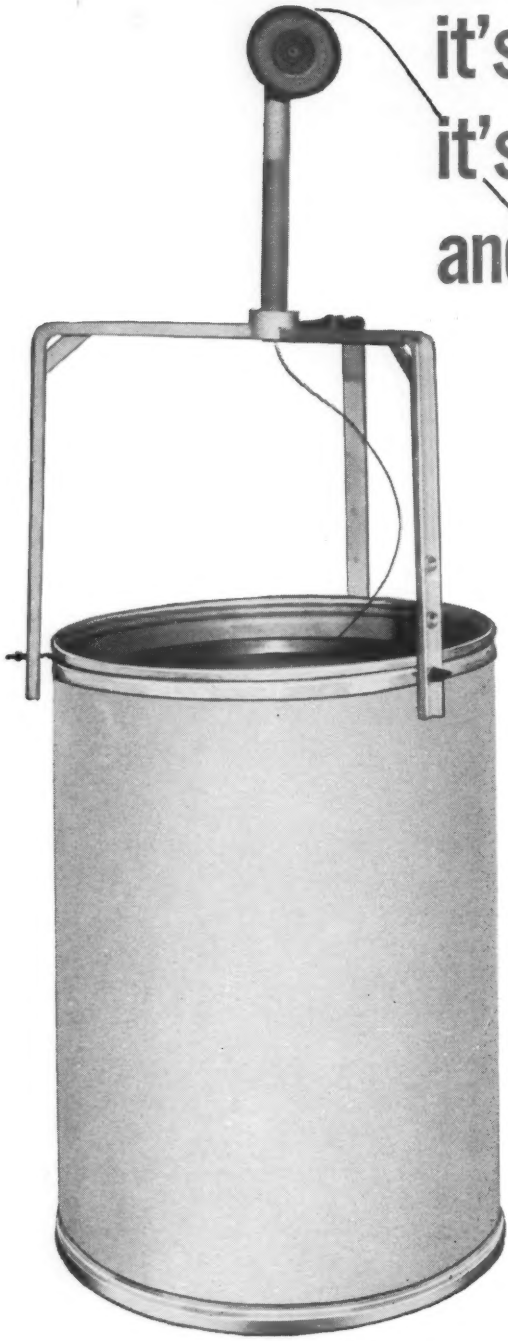
CUYAHOGA FALLS, OHIO, U. S. A.

COMPLETE COLD DRAWING EQUIPMENT . . . Continuous or Single Hole . . . for the Largest Bars and Tubes . . . for the Smallest Wire . . . Ferrous, Non-Ferrous Materials or their Alloys.

...IAL PUBLICATION OF THE WIRE ASSOCIATION

Payoffpak... ®

it's new...it's different... it's ideal for handling and processing WIRE!



PAYOFFPAK—Continental's newest fibre container—offers wire manufacturers and fabricators a revolutionary new development in wire packaging, handling and dispensing.

SAVES WORK—Wire is automatically packaged in the Payoffpak as it is drawn, eliminating such operations as stripping, tying, handling, splitting and wrapping.

SAVES TIME—Payoffpak can hold 600 lbs. Downtime on the wire drawing machine, due to stripping operations, is greatly reduced.

ELIMINATES REELS—Single standard-size Payoffpak eliminates reels and need for wide range of block sizes.

CUTS SHIPPING COSTS—Inexpensive, light-weight Payoffpaks travel for less because of extremely light tare weight.

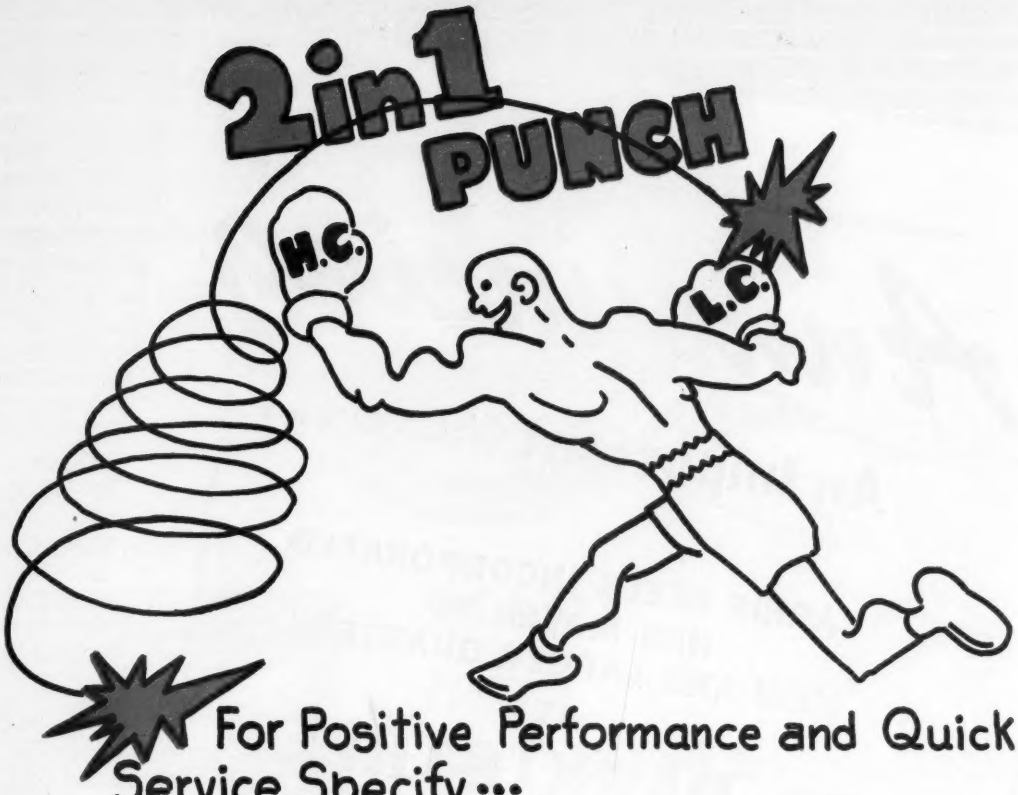
HANDLES AND STACKS EASILY—In-plant handling of Payoffpaks is easy with conventional hand trucks. High stacking strength means you can use maximum storage space, too.

A survey indicates that often more than 50 labor steps are needed to convert 500 pounds of steel wire in standard eight inch coils—but you can do the same job with Payoffpaks in an average of five operations. No wonder they are calling this new container "the long-playing record of the wire industry" See how Payoffpaks can pay off for you. Call Continental for complete information on this exciting new way to package, handle and dispense wire.

CONTINENTAL CAN COMPANY

FIBRE DRUM DIVISION • VAN WERT, OHIO

New York • Philadelphia • Pittsburgh • Tonawanda • Cleveland • Chicago
Atlanta • St. Louis • San Francisco • Los Angeles • Eau Claire



For Positive Performance and Quick Service Specify ...

"America's finest Wire Drawing Lubricants"

HAVE YOU INVESTIGATED

Standard 55?

More Rope Wire Is Drawn Thru Standard No. 55 Than All The Rest of the Wire Drawing Lubricants Combined.

Standard Industrial has pioneered in most of the outstanding contributions to better wire drawing through better lubricants. Consult Standard Industrial for the solution of your difficult problems.

Standard No. 55 Has Numerous Other Splendid Applications—May We Show You Why?

Standard Industrial Compounds Co., inc.

4600 WEST FERDINAND STREET
CHICAGO 44, ILLINOIS
TELEPHONES: Mansfield 6-9324-5-6

Announcing

An Important Move . . .

CARRIS REELS INCORPORATED
HAS MOVED TO
NEW AND LARGER QUARTERS
AT

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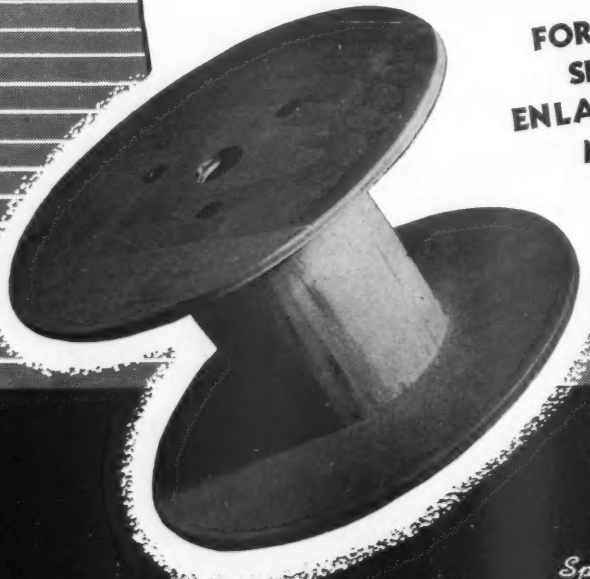
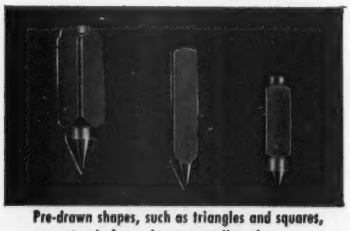
RUTLAND, VERMONT
PHONE PROSPECT 3-7388

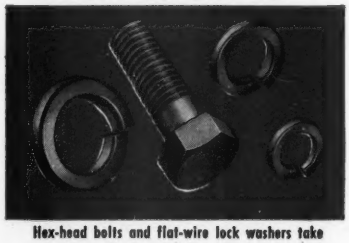
FOR BETTER CUSTOMER
SERVICE THROUGH
ENLARGED AND IMPROVED
MANUFACTURING
FACILITIES



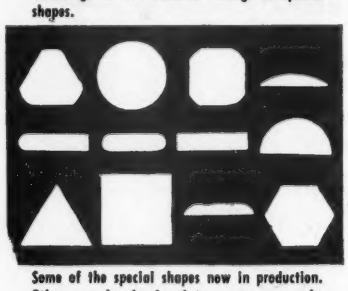
CARRIS REELS
INCORPORATED
Specialists in the design and manufacture of
PLYWOOD REELS AND SPOOLS



Pre-drawn shapes, such as triangles and squares, are naturals for carburetor needle valves.



Hex-head bolts and flat-wire lock washers take advantage of the material savings of special shapes.



Some of the special shapes now in production. Others can be developed to meet your needs.

ALLOY

Special Wire Shapes

CUT COSTS

Improve Product Performance

Alloy Special Wire Shapes eliminate costly machining time and cut metal waste. No need to start with round wire and then machine half of it away to get the shape you want. Alloy Metal Wire Division is ready to supply you with Stainless and Nickel Alloy wire in just about any special shape you may require. Some of the standard shapes available are shown here. We will be more than willing to work with you in the development of any other shape.

Drawn Alloy Wire Shapes provide other advantages in addition to reduced costs. Product quality and performance are also improved. The drawn wire insures uniformity of cross-section and a smooth, flaw-free surface.

For more details on Alloy Special Wire Shapes or for information on Stainless, Nickel Alloy or Electrical Resistance Wire, Rod and Strip, drop us a line. We are happy to be of service to you.

"Quality Products since 1919"

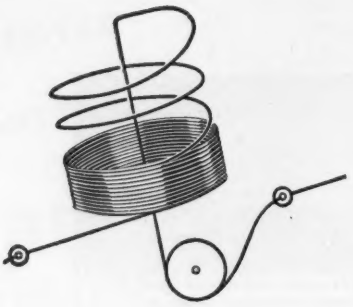
ALLOY METAL WIRE DIVISION

HKP

H. K. PORTER COMPANY, INC.
of Pittsburgh
PROSPECT PARK, PENNSYLVANIA

MORGAN-CONNOR

Cooling by AIR



If you want
High Speed
Wire Drawing

You must have
High Efficiency
Wire Cooling

The Morgan-Connor System of Air Cooling is proving its superiority in many mills.

Ask about it.

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WORCESTER, MASS.

WM-85

WIRE AND WIRE PRODUCTS*

Reg. U. S. Pat. Off.

A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable.

DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 30 September, 1955 No. 9

Designated as Official Publication By The Wire Association

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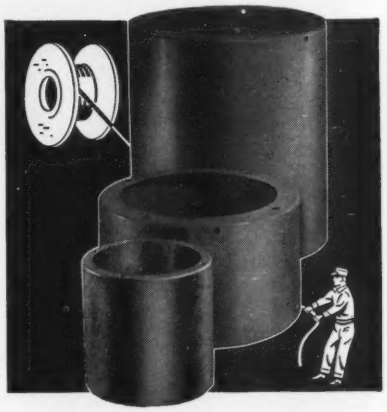
REPUBLIC

FLANGED STEEL TRAVERSES



are:

1. Light in weight
2. Durable
3. Strong
4. Easy to assemble
5. Smooth—free from rough spots that might damage plastic-covered cable.

Made in sizes up to 56-inch diameter and 48-inch traverse—in plain, painted or hot dip galvanized finish—as light as 18-gauge steel. Width of flange and number of bolt and drain holes furnished to your specifications. Available for prompt delivery. Write for prices.

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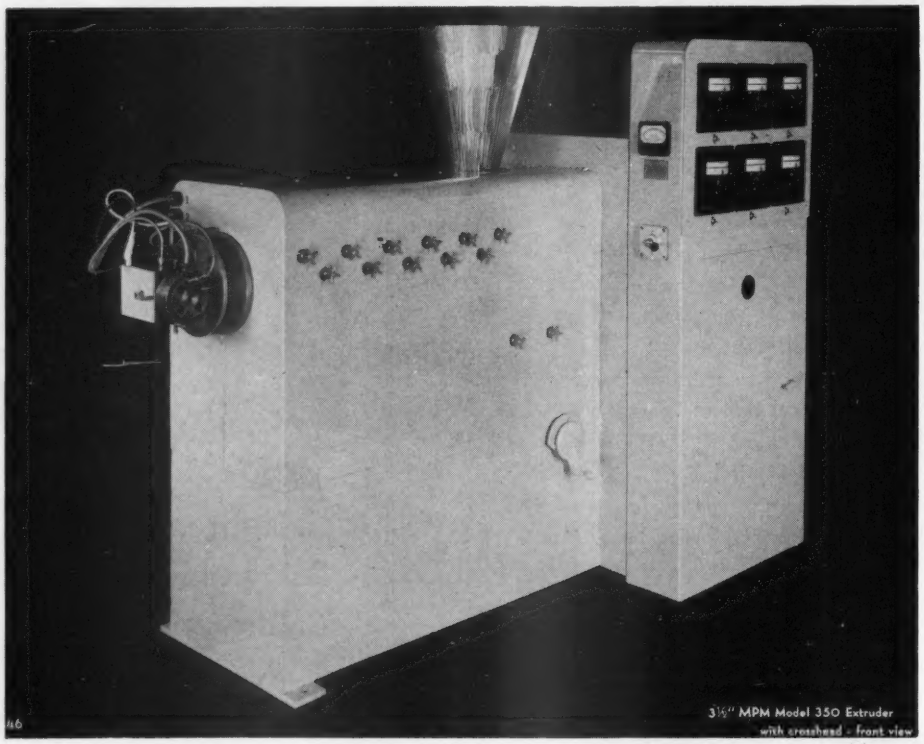
"Modern" INSULATING EQUIPMENT

is designed for those electric wire manufacturers who demand the best in extruders.



Shown at left: 3½" MPM Model No. 350 Extruder with crosshead, front view.

MPM Extruders are used by nearly all material suppliers, by laboratories for quality testing, and for production. One large electric wire manufacturer now has 17 MPM Extruders-reorders for them indicate the satisfaction they give.

MPM Extruders have the utmost flexibility and will handle a wide range of compounds and cross sections, as they are equipped with the best in temperature controls.

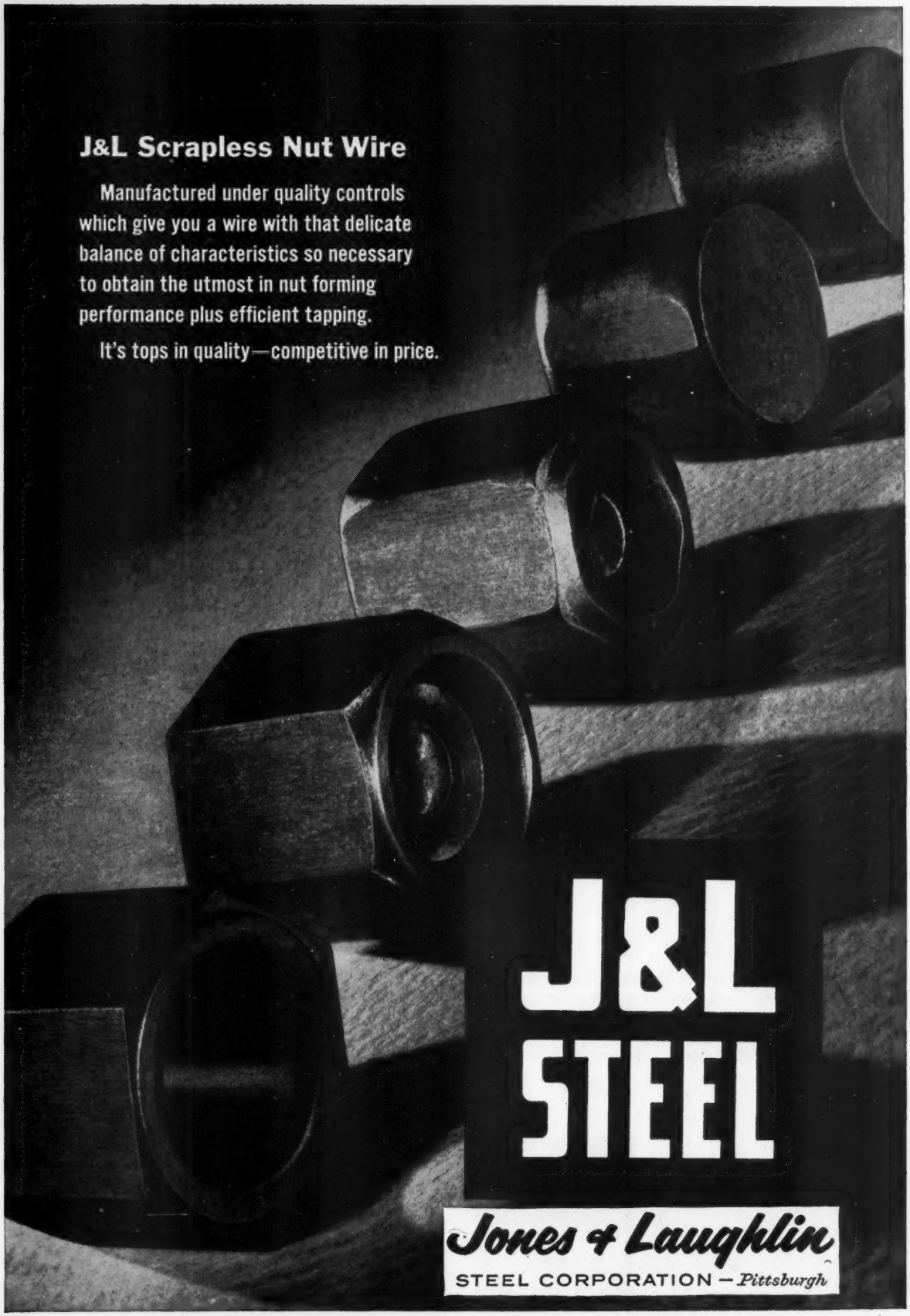
Literature upon request with questionnaire to determine the sizes, types and production requirements. MPM equipment is used in all principal foreign countries, indicating flexibility with many compounds.

Complete line of accessory equipment, such as dual take-ups, capstans, spark testers, measuring units etc.

MODERN PLASTIC MACHINERY CORP.

15 UNION STREET • LODI, NEW JERSEY, U.S.A.

Telephone GRegory 3-6218


J&L Scrapless Nut Wire
Manufactured under quality controls which give you a wire with that delicate balance of characteristics so necessary to obtain the utmost in nut forming performance plus efficient tapping.
It's tops in quality—competitive in price.
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STEEL
Jones & Laughlin
STEEL CORPORATION — Pittsburgh

How a special wire cloth

"wraps up" better crops

● Fanning mill cloth—used in huge machines for grading seeds—must be virtually perfect dimensionally. Even slight deviations in the mesh openings affect the value of seed crops . . . for grading must be *precise* under rigid government inspection.

Like other producers, the *Reynolds Wire Division* of National-Standard had been supplying cloth of bright galvanized wire. Could it be improved upon? After prolonged research with various finishes and types of wire, Reynolds hit on the idea of developing cloth of National-Standard's Copperply® wire for this special use.

Copperply fanning mill cloth, now available, offers remarkable new advantages. Its soft, electroplated copper coating "sets" better, permitting extreme accuracy in weaving and greater stability in use. Slick and bright, it speeds the *flow* of seeds in screening. Finally, its conductivity permits effective grounding to avoid seed accumulation due to static electricity.

Here's only one of many, many examples of how Reynolds undertakes new developments to help customers solve problems and produce *better* products, often at *lower* cost. But problem or no problem, Reynolds customers, and National-Standard customers in general, know the satisfaction, the value, of exceptional service and cooperation. Try us; you'll see.

NS
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Company
NILES, MICHIGAN

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Tire Wire, Stainless, Fabricated Braids and Tape
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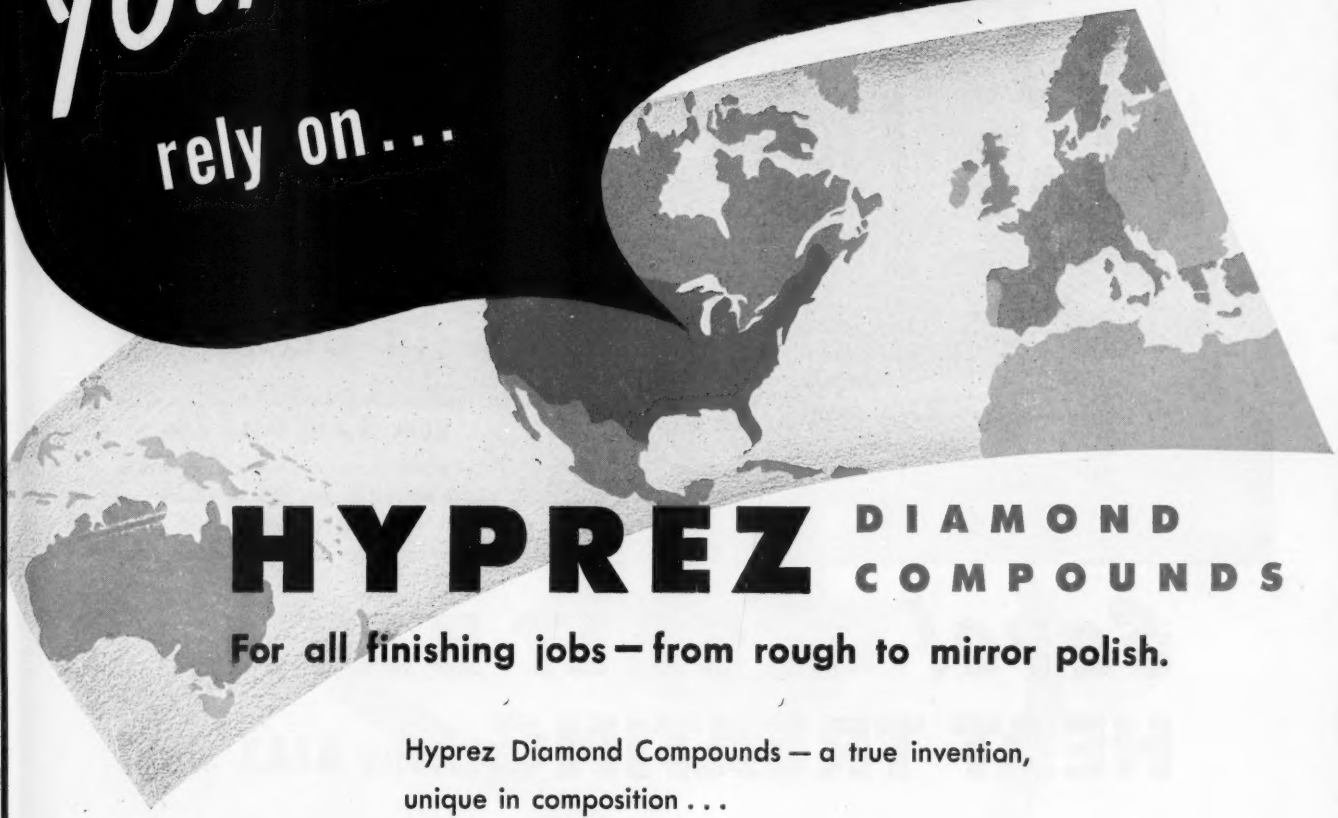

HYPREZ DIAMOND COMPOUNDS

For all finishing jobs — from rough to mirror polish.

Hyprez Diamond Compounds — a true invention, unique in composition . . .

- Are used in 19 foreign countries, in addition to the United States and Canada.
- Are patented in Switzerland, Sweden, Great Britain, and France.
- Are manufactured under exclusive license in Great Britain, Switzerland, and France.

This worldwide acceptance — the result of 15 years of research and rigid quality control — is guarantee that Hyprez will do your finishing job best.

HYPREZ, the original Diamond Compound, is available in types and grades for every finishing requirement; in 18- and 5-gram sealed cartridges for use with the Hyprez Applicator Gun.

HYPREZ DIVISION
ENGIS EQUIPMENT COMPANY
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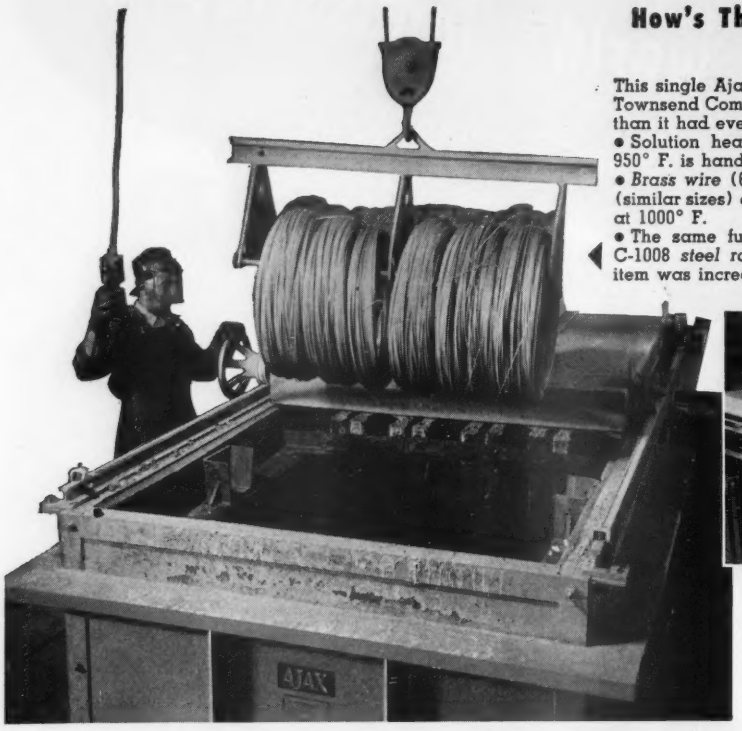
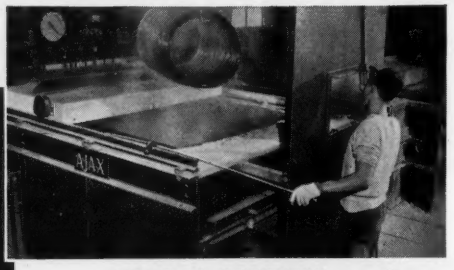


How's This for Heat Treating Economy PLUS Versatility?

This single Ajax Salt Bath Furnace does 3 different jobs for the Townsend Company, New Brighton, Pa. . . . and does each better than it had ever been done before.

- Solution heat treating of four different *aluminum alloys* at 950° F. is handled at 1,000 pounds per hour.
- *Brass wire* (65-35 from 1/16" to 3/8" diameter) and *copper wire* (similar sizes) annealed in batches of 1,000 pounds in 30 minutes at 1000° F.
- The same furnace is used for stress relieving cold headed C-1008 *steel rods* 1/2-inch in diameter. Production of this one item was increased 400%!



DONE IN MINUTES!

A 250-pound charge of stainless steel wire is quickly brought to annealing temperature of 1850° F. in this Ajax electric salt bath furnace. Wire is essentially used for welding rods.

Save! with SALT BATH HEAT TREATING...the AJAX way!

No other process can match the Ajax Electric Salt Bath Furnace, for speed or low cost of equipment in the heat treating of steel, and non-ferrous wire.

You get greater and faster production in less floor space. Quality is improved—wire is heated more uniformly. Atmospheric effects (scaling and decarburization) are eliminated.

Summing up—the advantages of the Ajax Electric Salt Bath Furnace in specific applications are:

PROCESS ANNEALING . . . Bigger furnace charges heat treated in minutes instead of hours . . . scale eliminated . . . lowest over-all equipment investment . . . smallest floor-space requirement.

DESCALING . . . More work handled in less time . . . greatly reduced metal loss . . . minimized acid consumption by the Du Pont, the Virgo or the "Kolene" process.

PATENTING . . . Faster production with greater product uniformity . . . lower operating costs and, in many cases, the elimination of a separate cleaning operation.

CLEANING, PREHEATING and FLUXING (preparatory to aluminizing or other special processing) . . . Clean, scale-free surfaces obtained more quickly and at appreciably less cost.

Write for case histories—or, better yet, send a representative batch of work to our laboratory for treatment to prove our claims—no obligation.

AJAX ® HULTGREN

Associate Companies: Ajax Electric Furnace Corporation, Ajax Engineering Corporation, Ajax Electrothermic Corporation

electric SALT BATH furnaces

AJAX ELECTRIC COMPANY • 928 Frankford Avenue, Philadelphia 23, Pa.

There's room for greater profits

. . . with the NEW Torrington W3001

TORSION SPRING WINDER

Room — room in which to work — is the outstanding feature of Torrington's new torsion spring winder. This modern, high production machine actually provides the largest tooling area ever devised. In addition, the W3001 offers many other advantages which will help spring-makers boost their production of torsion springs and reduce their costs at the same time.

• Tooling area measures 12" by 18" • Tooling is faster and easier • Tools themselves can be made sturdier and more durable • Shafts on 3 sides plus vertical 2-slide attachment give great versatility in producing complex forms • Capacity extends to 10 turns of .080" wire, thus meeting the great majority of customer requirements for torsion springs • Rugged design means years of trouble-free operation with minimum downtime for maintenance and repairs.

The Torrington Manufacturing Company has built more spring coiling machinery since 1937 than all other manufacturers combined. The knowledge and skill gained while serving spring makers during this period has now been used to create a torsion winder which we firmly believe is the finest ever offered to the industry. If you manufacture torsion springs, this new machine will give you faster, more efficient production and unprecedented versatility to meet your customers' most exacting needs.

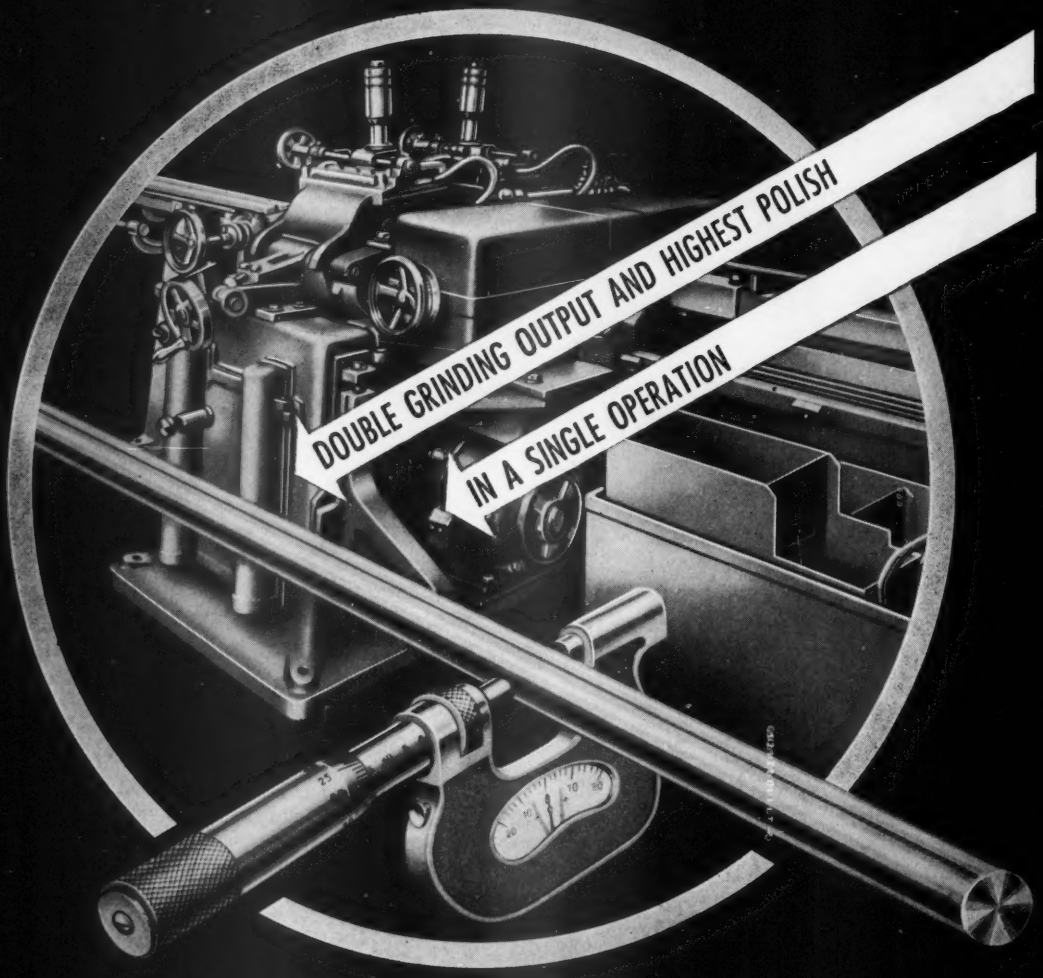
Call or write, *now,* for full information.

THE
TORRINGTON
MANUFACTURING COMPANY
TORRINGTON · CONNECTICUT
WIRE FORMING MACHINERY DIVISION

SCHUMAG AACHEN

GRAPHIK JUPP KUCKARTZ

CENTERLESS BAR GRINDING AND POLISHING MACHINE



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24 minutes of exciting information for manufacturers of

- SCREW MACHINE PARTS
- WIRE PRODUCTS
- NON-FERROUS FORGINGS

"IN THE CHIPS" reveals how men and machines work together to give you easier-working, cost-reducing brass and other copper alloy rod and wire.

You see remarkable close-ups of modern screw machine operations—including incredibly fast and accurate turning, deep drilling, reaming and tapping. There are fantastic slow-motion sequences of almost-human machines that transform wire into finished products at lightning speed!

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Your **DIES** last longer, too, with **DURPONS®**

We've stressed so often the fact that in wet drawing non-ferrous metals, Nopco Durpon Drawing Compounds last *twice as long*, and cost no more... you may have overlooked the fact that Durpons also mean *much longer life for your dies.* Which factor makes for the *biggest* saving, we hardly know. Both are well worth having.

The reasons for this long life are two: a buffer which prevents the breakdown of the emulsion, and a sequestering agent which keeps the bath *clean.* Try these money-saving compounds and see for yourself. Mail the coupon today.

"Stay Stable Longer"

DURPON—*for intermediate gauge wire*
DURPON L—*for heavy wire, rods, and tubes*
DURPON FW—*for fine wire*

NOPCO

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Please send me a copy of your technical bulletin and a free trial sample of: DURPON ☐ DURPON L ☐ DURPON FW ☐

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FIRM_____
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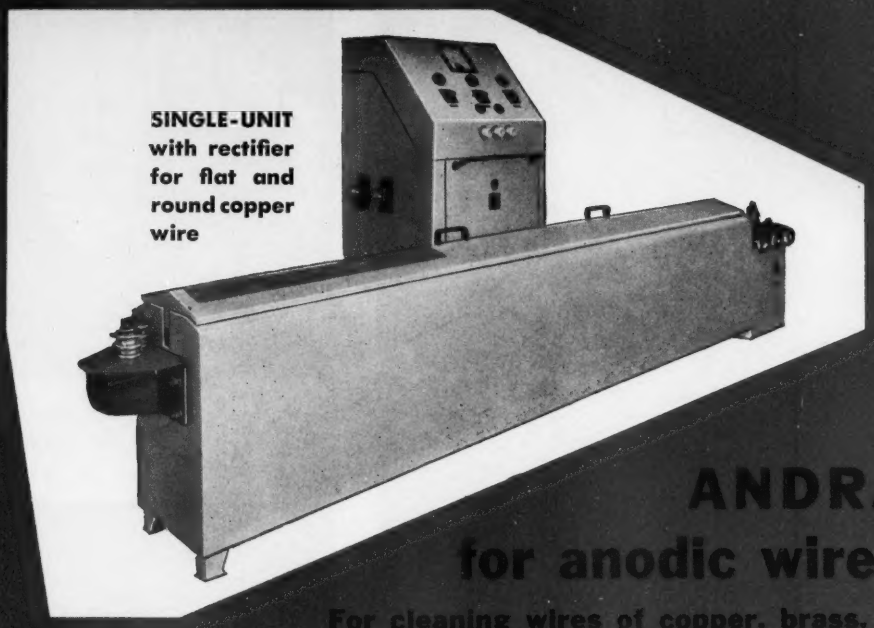


SINGLE-UNIT with rectifier for flat and round copper wire

ANDRA-UNITS for anodic wire cleaning

For cleaning wires of copper, brass, bronze, stainless or alloyed steel, iron, nickel, silver, etc.

Advantages of ANDRA

1. The metal particles adhering to the surface of the wire are completely removed.
2. The surface of the wire is smoothed, rough parts, burrs and drawing grooves are largely eliminated.
3. The oxide films are entirely removed and, in addition, the surface is brightened.
4. The strength, elongation and other properties of wires remain unchanged.
5. The wire is perfectly prepared for a following coating with varnish, plastic, silk or other insulation.
6. By removing every kind of roughness on the surface the wire attains a thoroughly prepared surface for the ensuing coating and obtains after the insulation a uniform dielectric strength.
7. Owing to the complete cleaning of the wire surface it is possible to gain high quality insulation with thin layers.
8. Damages of wire-drawing die are considerably diminished and contamination of the dipping or lacquering bath is avoided.
9. Losses of material by deplating are extremely low and well within the tolerances. Tinsels of precious metals are recuperated.
10. The use of the ANDRA Wire Cleaning Unit, therefore, results in an improvement of quality of the produced wire and in the economy of the wire-drawing and finishing processes.

ruthner

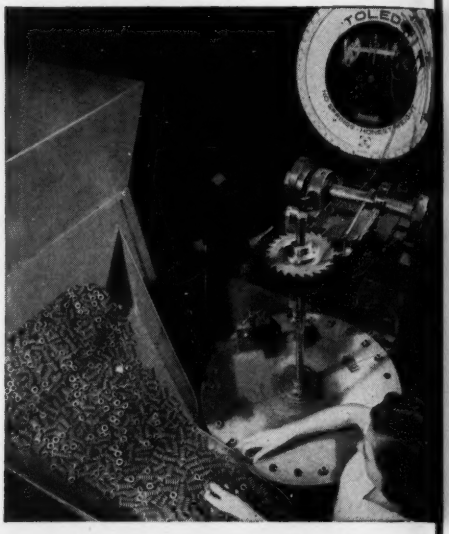
ELECTROCHEMICAL-METALLURGICAL INDUSTRIAL PLANT AND EQUIPMENT

VIENNA 3, SALMGASSE 6 · AUSTRIA · TELEPHONE U 12-5-75

TELEWRITER: VIENNA 01-1273 · TELEGRAMS: RUTHNERCHEMIE W'EN

Torque bars, made from high quality oil tempered spring wire, must meet exacting test requirements before they are shipped for installation in automobiles to raise trunk lids.

Selection of wire for torque bars starts with testing for stress-strain characteristics.



Compression springs of .177-inch diameter oil tempered spring wire are individually load tested on Toledo scales for precision accuracy.

Steel Bars With A 400-Pound Kick

How Precision Spring Corporation counts on uniform quality in Pittsburgh Steel's wire to produce millions of springs that do not fail in service.

The hottest new development in steel springs these days is the torque bar.

Already in widespread use as the mechanical storehouse of energy that helps lift the lid on your automobile trunk, you can look for it to start showing up in an increasing variety of applications—in machinery, appliances, and elsewhere.

Key element in the success of the torque bar is its simplicity. Compared to coil springs, it relies less on design and more heavily on the inherent qualities of the steel from which it is made.

The steel quality required is indicated by the fact that a finished torque bar, 43-inches long and weighing only 1¼ pounds, can give your trunk lid an upward flip with a force of nearly 400 inch-pounds. And it can do this year-in and year-out for longer than the useful life of your car.

You can easily see, therefore, how the choice of steel wire for torque bars is an important one. Here's how Precision Spring Corporation of Detroit makes its selection.

The bar for an auto trunk lid is made from .343-inch diameter high

carbon oil tempered spring wire having a tensile strength of approximately 200,000 psi and a yield strength of not less than 150,000 psi. This wire arrives from the mills of expert wire producers such as Pittsburgh Steel Company.

Selected samples are placed in a Tinius-Olsen Super "L" tensile tester. Stress-strain characteristics of the wire—its tensile strength, elastic limit, and yield strength—are electronically charted on a graph.

The correlation of these characteristics shows when the wire begins to take a set. Reduction in area of cross section measured at the break indicates that the wire is not too stiff and brittle for proper forming.

These tests assure Precision Spring that the wire will meet the requirements for torque bars before production starts. Once the wire is in production, Precision counts on consistent uniformity throughout the shipment to provide long trouble-free runs.

In forming the bar, it is given a total of 11 bends. Five of these are 90 degree bends on a radius less than the diameter of the wire. So you can see that this wire must have formability. At the same time, it must retain its springiness.

Finished bars are tested on special equipment. On this particular torque bar, a maximum torque load of between 720 and 900-inch pounds is suspended from the bar for 24 hours. Then the bar is tested for a working torque load of between 320 and 397-inch pounds to make certain it will not take a set or fail in service.

If every bar were tested, however, costs would be prohibitive. Again, Precision must depend on uniformity in the wire it receives from Pittsburgh Steel. The sample selected must give a true indication of the performance that can be expected for all torque bars produced from the wire shipment.

This reliance on uniformity is not confined to production of torque bars alone. Precision Spring specializes in the tough jobs for automotive and other industrial spring users. It makes compression, extension, and torsion springs in an almost infinite variety of designs and sizes—on high-speed equipment geared to turn them out by the millions.

On any production run, variations in uniformity of the wire within a coil or from coil to coil will cause production interruptions. Beyond that, it results in costly inspection procedures to make sure all springs measure up to requirements.

Tension springs produced on this Torrington No. 4 automatic coiler, are made from .207-inch diameter oil tempered spring wire. The operator spot checks a spring for proper tension.

So Precision expects uniformity within the specification range from one end of a coil of wire to the other, and within each shipment of coils. That's what it gets in the spring wire it receives from Pittsburgh Steel Company, as proved by the fact that less than one spring in a million ever fails or breaks in actual field service.

Why not help lower your costs and assure the quality of your wire products by taking advantage of the know-how and modernized wire making facilities at Pittsburgh Steel Company? Its range includes: bright basic wire; low, medium and high carbon wire; all types of annealed wire; ACSR core wire; cold heading wire; oil tempered and MB hard drawn spring wire; and shaped wire.

This is supplemented by the range of fine wire specialties produced on up-to-date facilities of the subsidiary Johnson Steel & Wire Company, including: aircraft cord wire, armature binding wire, wire for brushes, metal stitching, hose reinforcement, stapling wire, bobby pin wire, tire bead wire, rope wire, oil tempered and MB hard drawn spring wire in smaller sizes, and music spring wire right down to sizes as fine as a human hair.

Call our closest district office today for prompt, personal attention that will give you the kind of wire you need, when and where you want it.

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TYPE WIRE	RECOMMENDED MONSANTO PLASTICIZER	ADVANTAGES
Type T and TW 60°C. UF-NMC Jackets	DIDP	Volatility ½ of DOP Higher extrusion rate Superior water resistance Good electricals Low pound volume cost
	DOP	High volume resistivity Excellent uniformity of quality Standard of the industry Good electricals
SPT (lamp cords, etc.)	Santicizer S-160	Low-cost primary plasticizer Good electricals Fast extrusion rate Improves compatibility of secondary plasticizers
	HB-20	Low-cost secondary plasticizer Good color Good electricals
80°C. appliance wire 90°C. appliance wire	DIDP	High retention of elongation after extended heat aging Good electricals
	TCP	Flame resistance Low volatility Grease resistance

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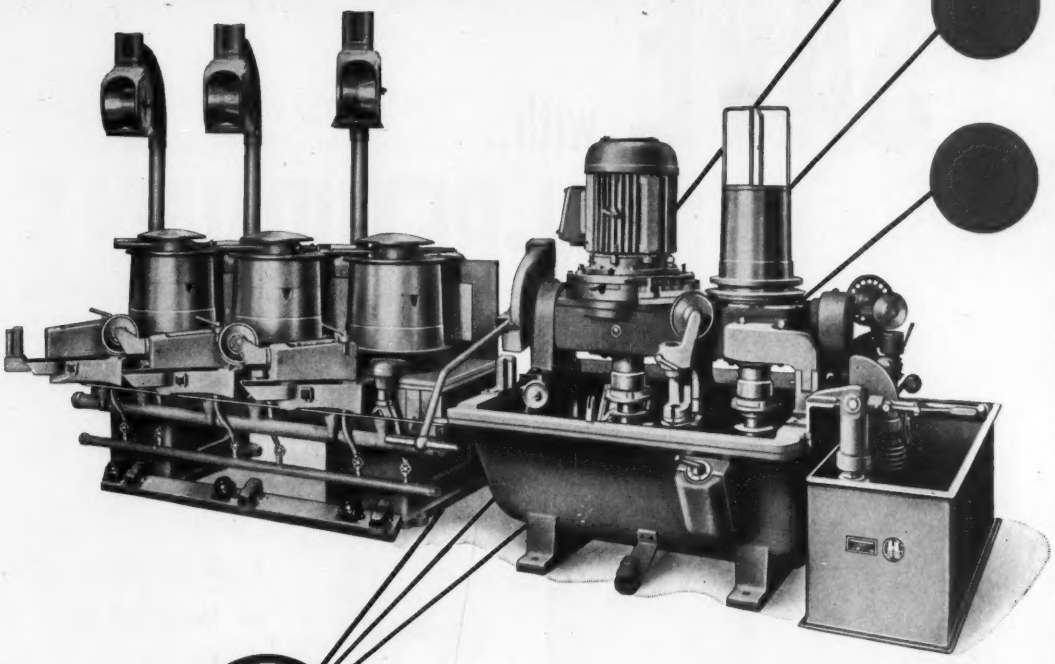

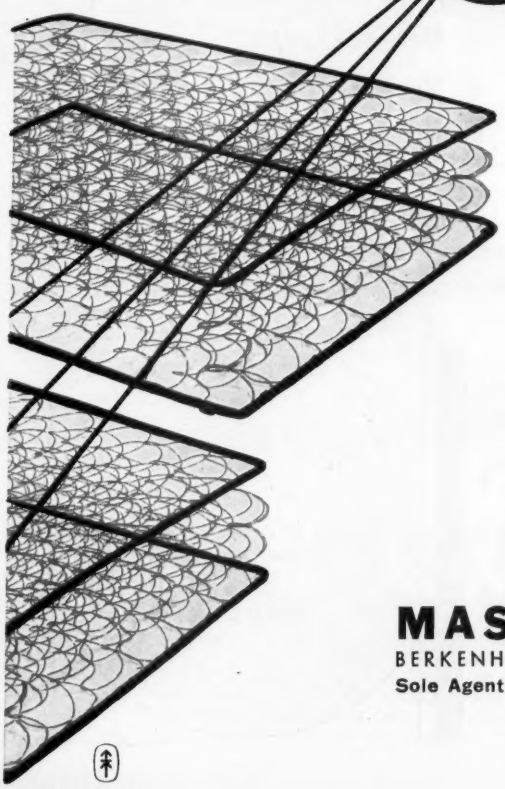

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machine with a coppering unit.

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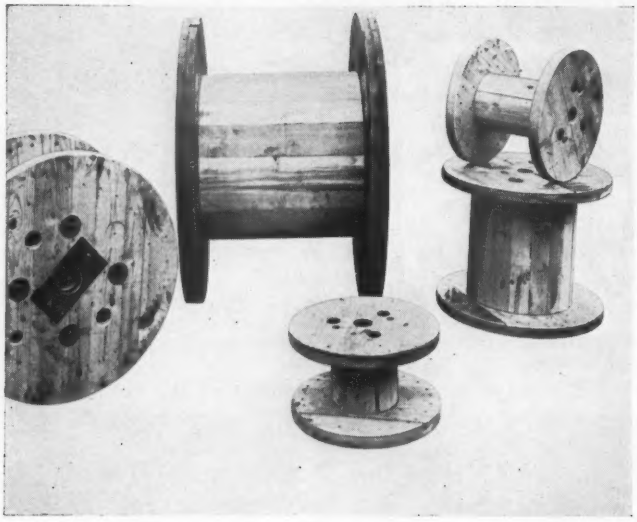

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Let us quote on your reel needs. Send your specifications. Better yet, visit our plant and see how and why our reels are made so well at so low a cost.
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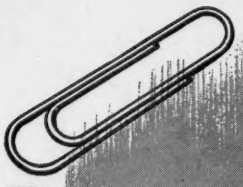
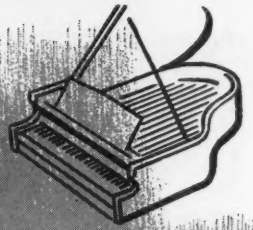


WIRE FOR PAPER CLIPS



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Whatever your problem is in

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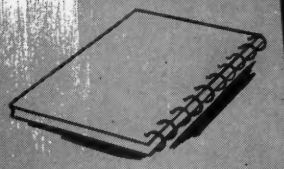
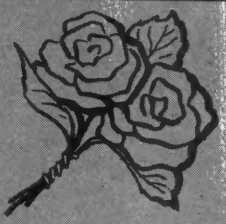
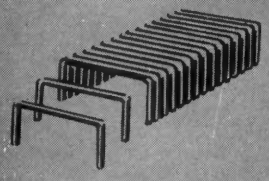


COIL BINDING WIRE

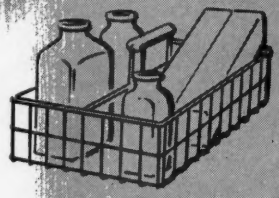


FLORIST WIRE



PREFORMED STAPLE WIRE

WIRE FOR TOY WHEELS



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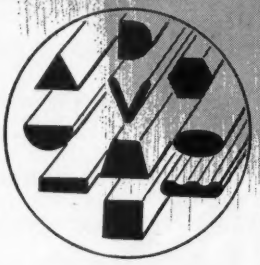

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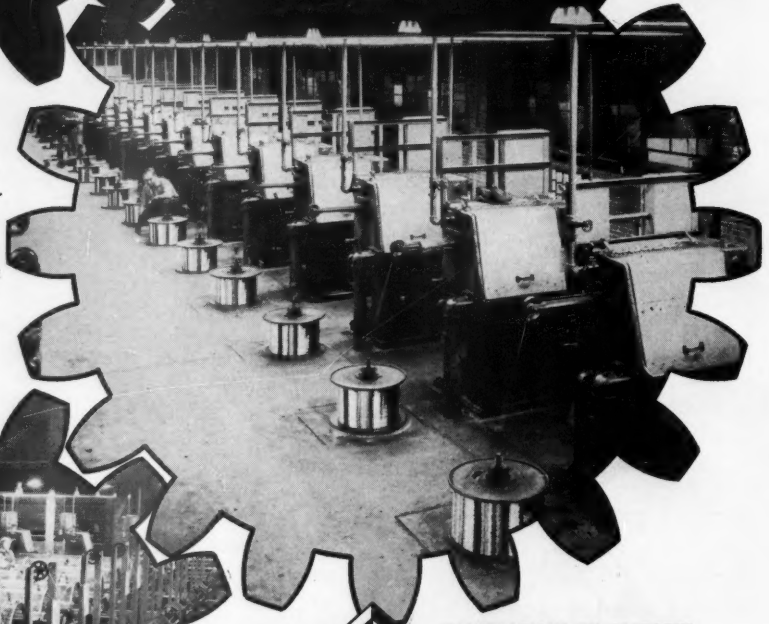

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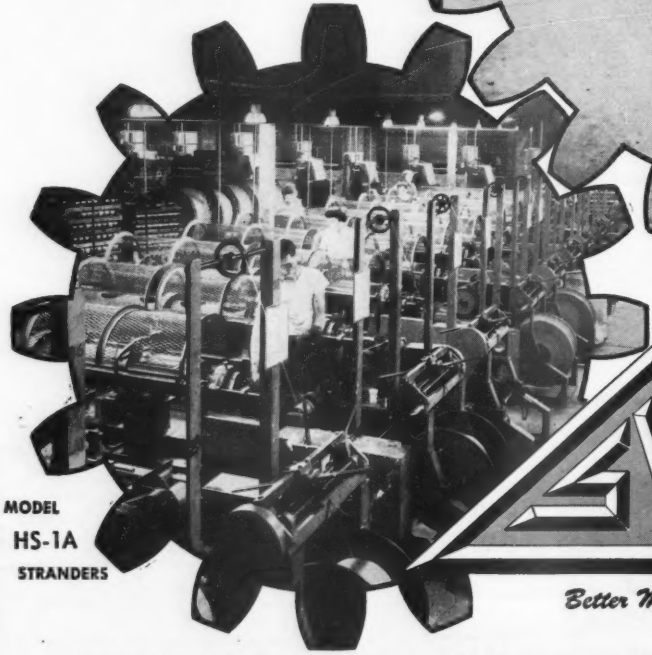
DESIGN and QUALITY features make them OUTSTANDING and your BEST investment



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STEEL TRAVERSES

FLANGED STEEL DRUMS FOR REELS

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WIRE • CABLE • WIRE ROPE

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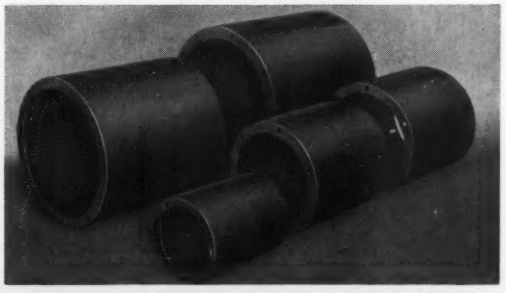

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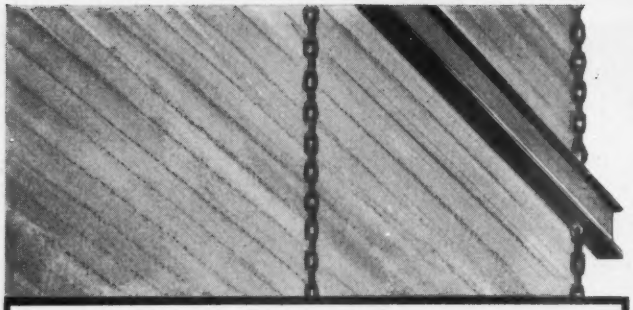

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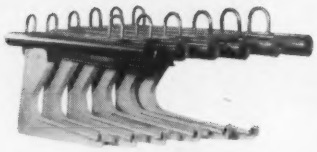

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These durable hairpin hooks feature a specially-designed drip trough on the load bar that picks up condensate and carries it out beyond the rod bundles. In addition, the all-welded Monel hooks are bolted to low-cost steel spreader bars that are easily replaceable at minimum cost.

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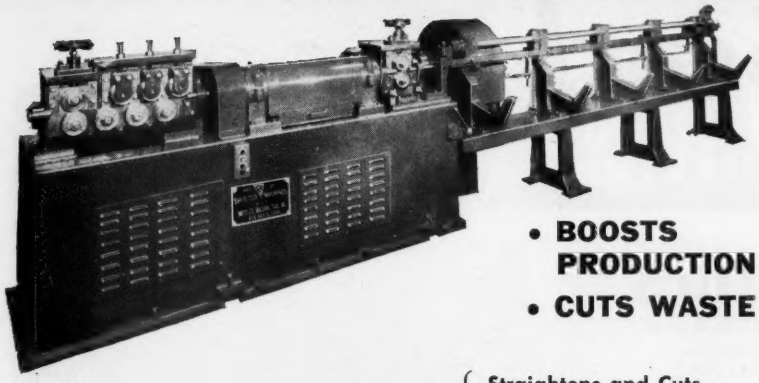

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Dual Control 3 AV { Straightens and Cuts ¼" to ½" diameter basic wire

Individual Control of Speed and Cut Off and Electrically Controlled Clutch and Target

With the Dual Control 3 AV you can run at the most efficient speed for the characteristics of the wire being used. And you get a clean cut at any length. Send for details.

A COMPLETE LINE

Constant Speed Machines are available for straightening and cutting wire from .025" to ½"

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Slide Feed Straighteners ⅜" x 10"; 9/16" x 10"
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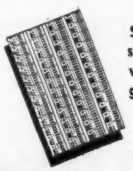
Tube and Bar Straighteners 7/32" to ⅝" bar; 1" tubing

Reels for coils up to 300 pounds



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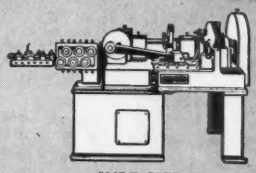
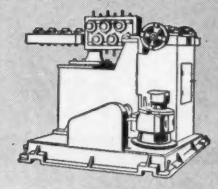
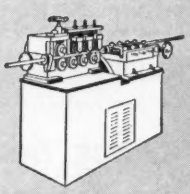


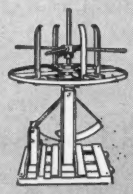
SLIDE FEED STRAIGHTENERS
3/8" x 10"; 9/16" x 10"



FEED STARTER AND STRAIGHTENER
Max. 5/8" dia.



TUBE AND BAR STRAIGHTENER
7/32" to 5/8" bar 1" tubing



REELS
400 lbs.

Gentlemen:

Please send us your recommendations. Our straightening and cut-off requirements are as follows:

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Firm .....

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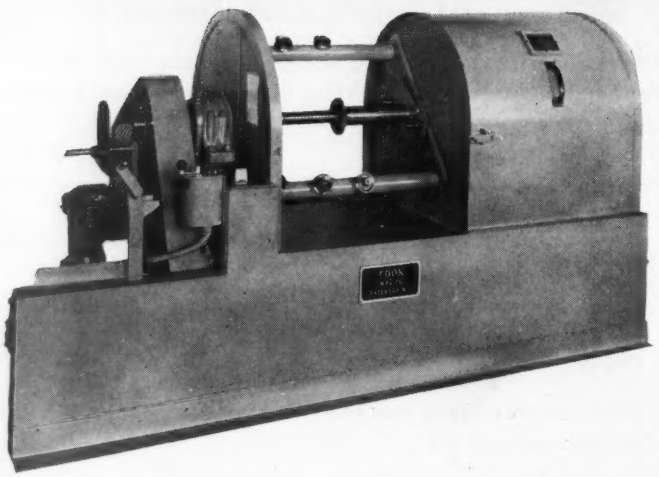
City ..... Zone ..... State .....

Put your Wire Production in High Gear!

2 machines in 1

Bunch AND Strand!



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(we'll be glad to qualify them all)

1. **LARGE TAKE-UP REEL**
2. **NO CAPSTAN**
3. **ALL WELDED, RUGGED CONSTRUCTION THRU-OUT**

Plus- **Covers minimum floor space—Bunch-Strand any number of wires concentrically**

LONG LIFE, LOW MAINTENANCE, HIGH PRODUCTION, IMPROVED PRODUCT

compare the price-the performance-the quality of a

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Celanese® CHEMICALS

PLASTICIZER

RECOMMENDED

CELLUFLEX* 179 EG

FOR

WIRE INSULATION

WHY

WEATHER RESISTANCE

DESCRIPTIVE DATA

CELANESE PLASTICIZER	GRADE	APPEARANCE	COLOR APHA Max.	SPECIFIC GRAVITY @20/20°C.	ACIDITY	ESTER VALUE % Min.	PERMANGANATE TIME, Min. (in Minutes)	WATER CONTENT % Max. by Wt.
CELLUFLEX* TPP triphenyl phosphate	99% Technical	White flakes	20 (3)	1.221 (1)	0.03 (2)	99	30	0.1
LINDOL* tricresyl phosphate; coal tar base	99% Technical	Clear transparent liquid	50	1.167 ± .005	0.1 (2)	99	30	0.1
CELLUFLEX* 179-A tricresyl phosphate; ortho content less than 1%	99% Technical	Clear transparent liquid	100	1.143 ± .006	0.1 (2)	99	30	0.1
CELLUFLEX* 179C tricresyl phosphate petroleum base	99% Technical	Clear transparent liquid	100	1.165 ± .005	0.1 (2)	99	30	0.1
CELLUFLEX* 179-EG† tricresyl phosphate, electrical grade	99% Technical	Clear transparent liquid	100	1.143 ± .008	0.1 (2)	99	30	0.1
CELLUFLEX* 112 a mixed ester	99% Technical	Clear transparent liquid	40	1.200 ± .005	0.1 (2)	99	30	0.1
CELLUFLEX* DBP dibutyl phthalate	99% Technical	Clear transparent liquid	25	1.045 ± .001	0.1 (2)	99	—	0.1
CELLUFLEX* DOP dioctyl phthalate	99% Technical	Clear transparent liquid	25	0.985 ± .004	0.1 (2)	99	—	0.1

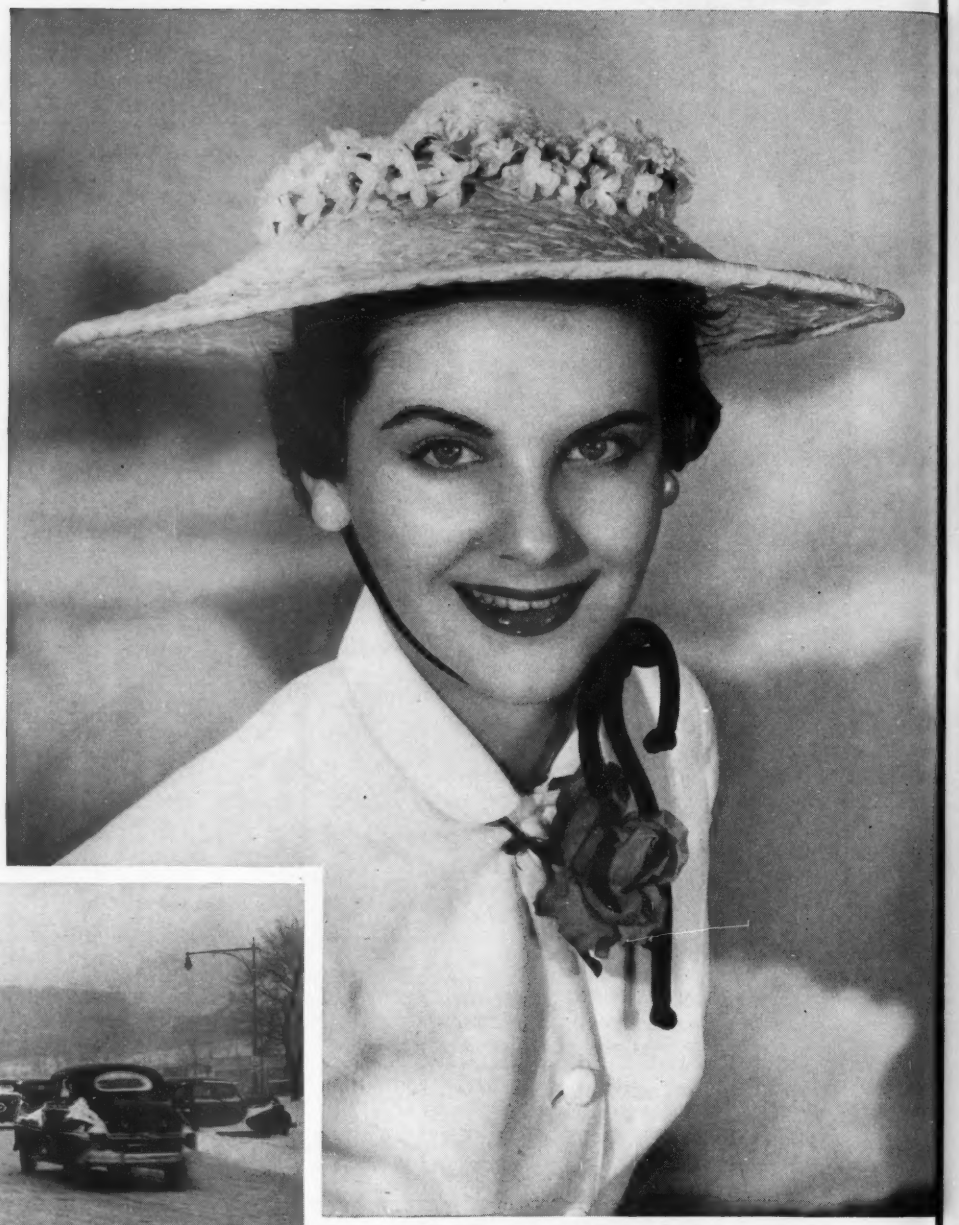
(1) @60/60° C. (2) Mg. KOH/gram sample (3) Molten †Volume Resistivity: 16 megohm/cm x 10^7 at 23° C. min.

Where weather and high volume resistivity are major considerations, Celluflex 179 EG is the specified plasticizer. 179 EG (electrical grade tricresyl phosphate) imparts excellent resistance to weathering and maintains high insulation value in vinyl wire and cable coverings.

Celanese is an expanding source of plasticizers for many jobs. Bulk stocks at convenient distribution points are ready to meet tight schedules. Combination shipments — Celanese Plasticizers and Solvents or Intermediates — yield an extra dividend in price differential and freight savings. Be on our mailing list for new plasticizer developments. Please drop a card to Dept. 591-I Celanese Corporation of America, Chemical Division, 180 Madison Avenue, New York 16, N.Y.

*Reg. U. S. Pat. Off.

Celanese® CHEMICALS



THE RIGHT SLANT. Her fashionable hat keeps its perky tilt, thanks to CF&I-Wickwire Hat Wire in the brim.

"NEITHER SNOW..." When the going's rough, drivers are thankful for tough, strong tire chains made of CF&I-Wickwire Chain Wire.

F O R T H O U S A N D S O F U S E S

from holding smart hats in shape... to holding cars and trucks on snowy roads, nothing does the job like wire!

The dramatic variety of jobs that wire can fill—almost infinite in number—is encountered every day in hundreds of diversified industries. Shown here are only a few of the countless uses to which wire can be put.

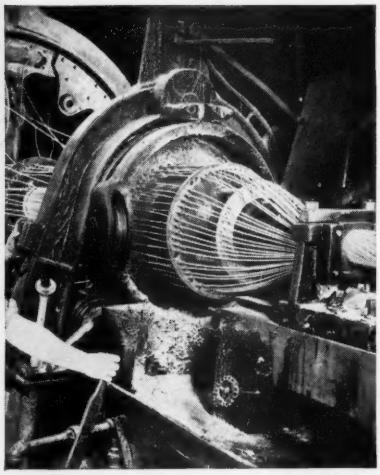
Wire, hair-thin to rod-thick, can be supplied with properties engineered to meet practically any need you may have for it. And CF&I-Wickwire Wire, with a century and a quarter of experience behind it, is ready to serve you by answering all your wire requirements.

Whatever you assemble, manufacture, or process, check into all the advantages you would gain by using CF&I-Wickwire Wire. You'll like doing business with CF&I-WICKWIRE, and the careful attention given your own particular requirements.

CF&I-Wickwire Wire is made in plants conveniently located from coast to coast. For detailed information, write our nearest district sales office.

SPEEDING AMERICA'S RECORD HOUSING PROGRAM. Stapling insulation to walls saves days of construction time and cuts building costs. CF&I-Wickwire Stapling Wire is used for all kinds and sizes of staples.

ALL WOUND UP. Here a submarine cable is being sheathed in CF&I-Wickwire Armor Wire for protection and resistance to mechanical failure.



DROPPING A MOUNTAIN with dynamite is accomplished with CF&I-Wickwire Fuse Wire for detonators.

IT'S CHILD'S PLAY to open today's sardine tins. Their sturdy key openers are made of CF&I-Wickwire Can Key Wire.

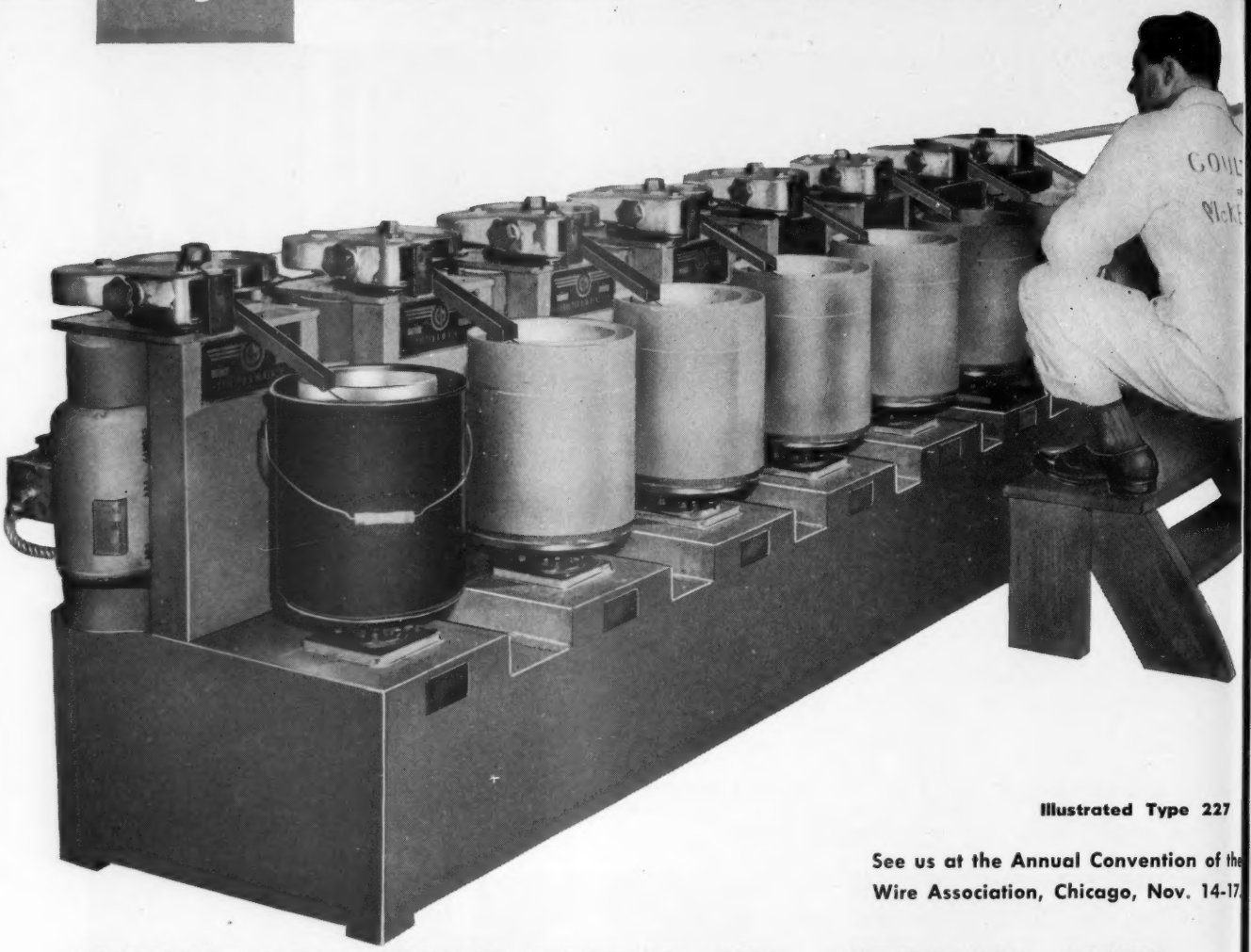
3143

CF&I

CF&I-WICKWIRE WIRE

THE COLORADO FUEL AND IRON CORPORATION—Albuquerque • Amarillo • Billings • Boise • Butte • Denver
El Paso • Ft. Worth • Houston • Lincoln (Neb.) • Oklahoma City • Phoenix • Pueblo • Salt Lake City • Wichita
PACIFIC COAST DIVISION—Los Angeles • Oakland • Portland • San Francisco • Seattle • Spokane
WICKWIRE SPENCER STEEL DIVISION—Atlanta • Boston • Buffalo • Chicago • Detroit • New Orleans • New York • Philadelphia

DRAW • PAK TAKE-UP UNITS



Illustrated Type 227

See us at the Annual Convention of the Wire Association, Chicago, Nov. 14-17

MULTIPLE-HEAD DIRECT TAKE-UP AND PACKAGING UNITS

Direct take-up to convenient process or shipping containers.

With the Coulter & McKenzie DRAW-PAK method you will realize longer continuous runs, larger container capacity, and better quality with far less handling.

Individual or common motor drives for galvanizing, annealing, enameling and tinning of most materials from fine soft copper to coarse high-carbon wire.

Arrangement, number of heads, and motor drives to meet your individual container, process and floor space requirements.

Kindly supply ALL process information when inquiring about DRAW-PAK equipment.

Coulter & McKenzie also makes a complete line of dereeling devices. Write for complete "D-PAKER" catalog.

Model	Std. Bare Wire Pkg. Wt.	Standard Package OD X HT X Construction	Optional Bare Wire Package Weight
127	500	20" x 30" Fibre	250 to 750
227	100	11" x 12½" Fibre or Steel	50 to 150
327	40	8" x 9½" Fibre or Steel	10 to 40

Patents Pending

Continental Can Company Licensee

771 WATER STREET
OPPOSITE RAILROAD STATION

TELEPHONE EDISON 5-1101
LIEBER'S CODE "MACKENZIE"

THE COULTER & McKENZIE MACHINE CO., INC.

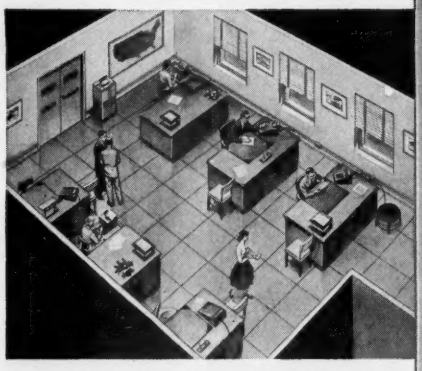
SINCE 1843

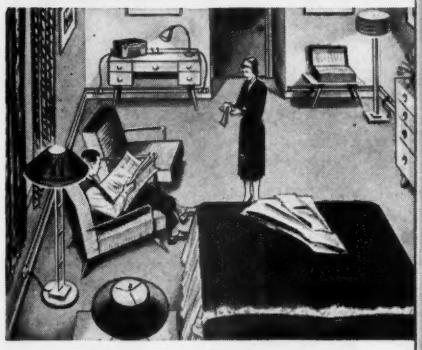
BRIDGEPORT 3, CONNECTICUT, U. S. A.

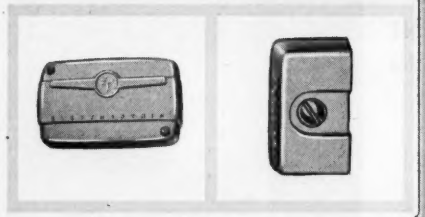
INCORPORATED 1881

a MARVINOL®

"RIGID" Compound forms and insulates BullDog's new ELECTROSTRIP*







ELECTROSTRIP is a new flexible, plastic strip containing two concealed electric wires. Individually-fused receptacle plugs can be snapped into place, instantly, anywhere along its length. This eliminates long, dangerous extension cords and multiple plugs. Installed unobtrusively around the walls or baseboards of a room, office, display area, shop or store, ELECTROSTRIP brings power conveniently to lamps, home appliances, office machines, small tools, and other small electrical units up to a total of 20 amps.

Naugatuck supplies the MARVINOL "Rigid" (non-plasticized) vinyl compound which has proved ideal for this new product because:

- MARVINOL resins form a tough, strong strip which can be bent by hand to fit wall contours and turn corners.
- "Rigid" MARVINOL compounds are far superior to soft or plasticized vinyls in electrical insulating properties. ELECTROSTRIP is listed by Underwriters' Laboratories, Inc.
- The built-in color and smooth, attractive surface produced by MARVINOL resins provide a ready-made, permanent finish which can be painted over if desired.

MARVINOL resins provide compounds with extreme dimensional stability plus a controllable degree of flexibility. They are non-flammable and highly resistant to heat, oils, acids, alkalies and ozone... can be made either transparent or opaque. If you have in mind a new or improved product requiring any or all of these properties, be sure to consult with us about MARVINOL "Rigid" vinyls.

*Reg. & mfd. by BullDog Electric Products Co., Detroit

Naugatuck Chemical

Division of United States Rubber Company

Naugatuck, Connecticut

BRANCHES: Akron • Boston • Charlotte • Chicago • Los Angeles • Memphis • New York • Philadelphia • IN CANADA: Naugatuck Chemicals, Elmira, Ontario

Rubber Chemicals • Synthetic Rubber • Plastics • Agricultural Chemicals • Reclaimed Rubber • Latices • Cable Address: Rubexport, N.Y.

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TO MODERNIZE YOUR PLANT — FOR THE BEST IN RUGGED, DEPENDABLE WIRE MACHINERY . . . THINK FIRST OF

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BUILT, PRODUCTION EQUIPMENT DESIGNED FOR LONG LIFE AND TROUBLE-FREE OPERATION . . .

A Spark Testing at C.V., Catalogue 2A
B Shaftless Take-Up, Catalogue 3E
C "Caterpuller" Class C, Catalogue 16
D Measuring Machine Type LV-OP, Catalogue 11A
E Wire Marking Machine, Catalogue 18
F "Maillefer" Extruder, Catalogue 16
G Pay-Off Stand Type VS, Catalogue 13H

FOR COMPLETE INFORMATION ON ANY OF THE JLE PRODUCTS SHOWN HERE, WE INVITE YOU TO REQUEST THE APPROPRIATE CATALOGUE SECTIONS LISTED ABOVE.

JLE **JAMES L. ENTWISTLE CO.** JLE

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THERE'S A
COMPLETE LINE OF ROEBLING

Galvanized

ROEBLING is a specialist in galvanizing with practically unmatched facilities for producing galvanized wire in enormous quantities and in complete size ranges. Hot galvanized is available in sizes from .283″ to .035″... Roegal (drawn galvanized) from .187″ to .005″.

And Roebling galvanized wire can be packaged in the way most convenient and economical for you... in coil diameters of 60″, 30″, 22″, 16″ and 8″...on reels, spools or handy spoolless cores.

You *pay* for the best when you buy galvanized wire. Make sure you *get* it—specify Roebling! John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

ROEBLING

Subsidiary of The Colorado Fuel and Iron Corporation

ATLANTA, 934 AVON AVE. • BOSTON, 51 SLEEPER ST. & 5 PITTSBURGH ST. • CHICAGO, 5525 W. ROOSEVELT RD. • CINCINNATI, 3253 FREDONIA AVE. • CLEVELAND, 13325 LAKEWOOD HEIGHTS BLVD. • DENVER, 4801 JACKSON ST. • DETROIT, 915 FISHER BLDG. • HOUSTON, 5216 NAVIGATION BLVD. • LOS ANGELES, 5340 E. HARBOR ST. • NEW YORK, 19 RECTOR ST. • ODESSA, TEXAS, 1920 E. 2ND ST. • PHILADELPHIA, 230 VINE ST. • ROCHESTER, 1 FLINT ST. • SAN FRANCISCO, 1740 17TH ST. • SEATTLE, 900 1ST AVE. S. • ST. LOUIS, 3001 DELMAR BLVD. • TULSA, 321 N. CHEYENNE ST. • EXPORT SALES OFFICE, 19 RECTOR ST., NEW YORK

Automatic Take-Up Now Has BUILT-IN DANCER CONTROL

Needs minimum attention from operator.

Reeling of wire is continuous and automatic, including transfer of wire from reel to reel and cutting of wire between reels. Operator needs only to replace full reels with empty ones.

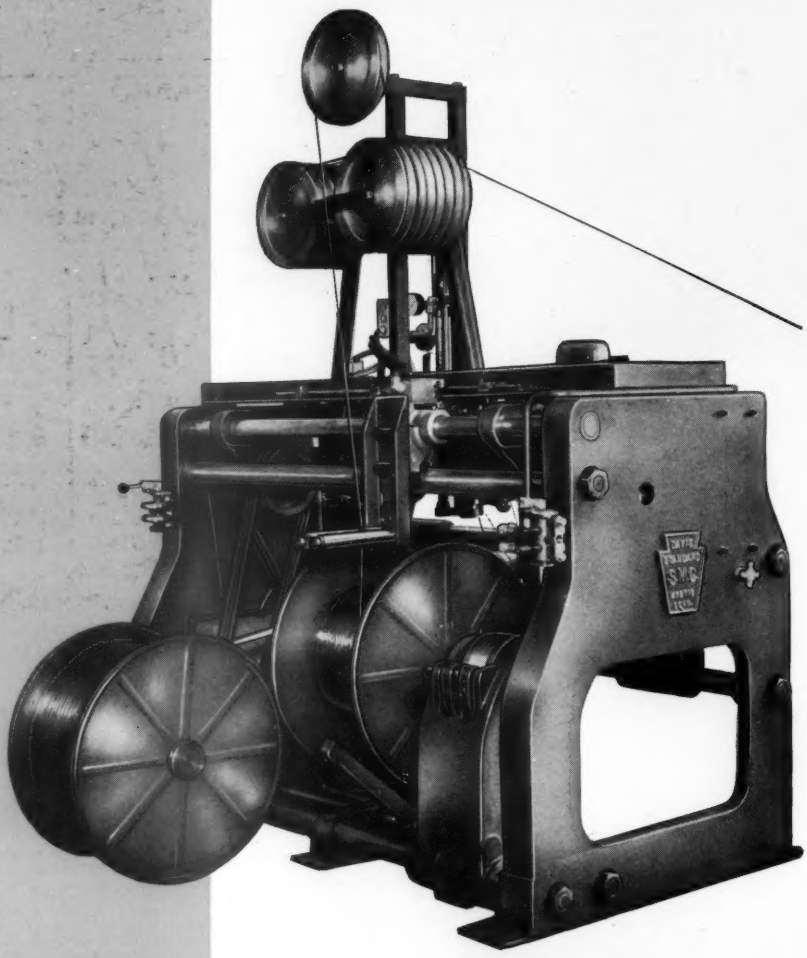
Can be put in any wire line.

Reel drive, by eddy-current-clutch motor, is completely independent of capstan and extruder speeds. This eliminates the need for any mechanical or electrical synchronization with other units in the wire line.

Requires no auxiliary dancer control.

Two pivoted arms on top of take-up provide a new kind of dancer control giving smoother operation than the conventional vertical column type. During transfer of wire between reels, pivoted arms spread apart to take up slack.

MODEL 30 DUAL REEL TAKE-UP REELS COATED WIRE AT SPEEDS UP TO 2500 FEET PER MINUTE.

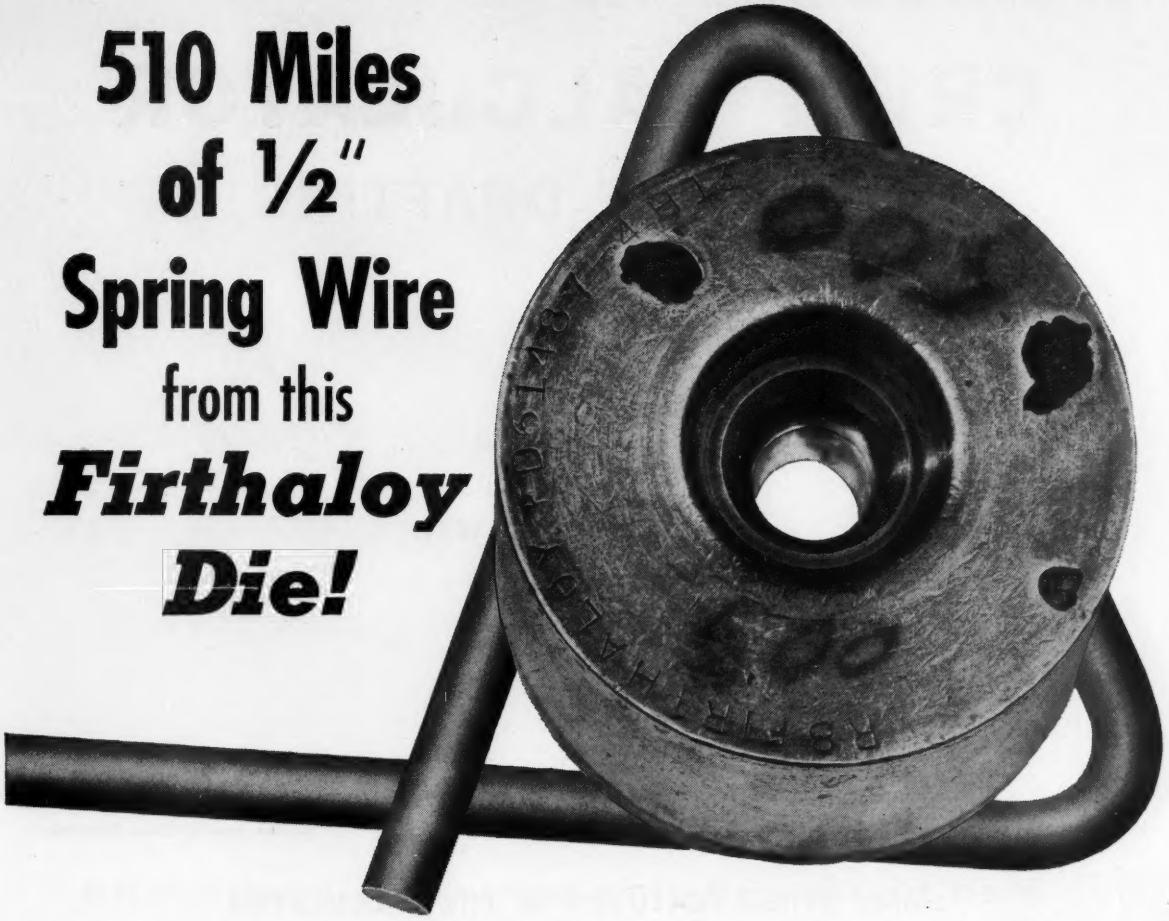


Model 30 Take-Up will increase the efficiency of your wire line. Write for catalog sheet containing full details.

DS **DAVIS-STANDARD**
SALES CORPORATION
10 WATER STREET, MYSTIC, CONNECTICUT

SOLE SELLING AGENTS FOR...**THE STANDARD MACHINERY COMPANY,** World's Largest Manufacturers of Custom-Built Extruding Machines
IN EUROPE AND THE STERLING AREA, CONTACT FINNEY PRESSES LTD., BIRMINGHAM, ENGLAND

510 Miles of ½" Spring Wire from this *Firthaloy Die!*



The unretouched photo of the Firthaloy draw die above may not be very pretty—but what die would be after drawing 1,800,000 lbs. of ½" high carbon spring wire! The important fact is, that despite the appearance of the steel casing, the Firthaloy carbide nib (standard grade H-13) had worn *only 1/1000 of an inch when it was retired after 6 years of continuous service!*

The leading New England manufacturer who returned the die to us for our "museum" thinks his 1948 purchase was a good one.

You, too, can get comparable results when you specify *Firthaloy* for your own die shop or from your tool and die maker . . . in round, square, hex and all special shapes.

Write for information or literature today

Mr. Tooley says—

"Firth Sterling offers wire manufacturers and fabricators the advantages of a *single* source of supply for both tungsten carbide dies and high grade die steels. This *complete* line, from famous Firthaloy carbide through almost one hundred grades of high speed and tool steels saves you time and money."

R-312

Firth Sterling

—INC—

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MILLS: McKEESPORT, TRAFFORD, DETROIT, HOUSTON

OFFICES AND WAREHOUSES*: BIRMINGHAM CHICAGO* CLEVELAND DAYTON DETROIT* HARTFORD* HOUSTON LOS ANGELES* NEW YORK PHILADELPHIA PITTSBURGH WASHINGTON WESTFIELD, N.J.

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High Speed Steels
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High Temperature Alloys
Sintered Tungsten Carbides
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High Temperature Cermets
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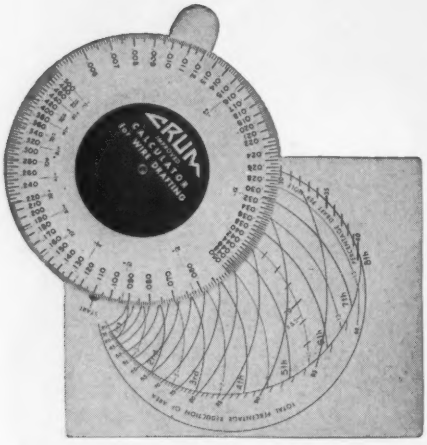
THE NEW and IMPROVED . . .

CRUM CALCULATOR

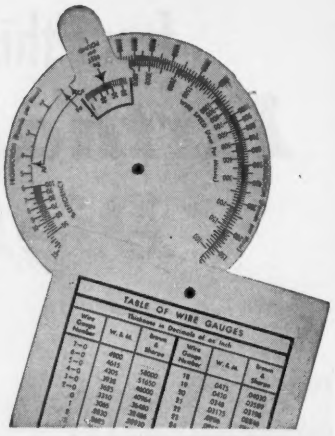
FOR WIRE DRAFTING



Front view of Crum Calculator.

THIS NEW DOUBLE-PURPOSE CALCULATOR WILL:

1. Provide quicker and more accurate information on die sizes and reduction areas;
2. Calculate wire production rates for various speeds and efficiencies.



Reverse view of Crum Calculator.

SOME OTHER FEATURES OF THE CALCULATOR

- Has new scale for more accurate determination of small percentages.
- Gives readings in B & S gauges.
- Intermediate lines provide reductions for 16 holes in one setting.
- New rectangular shaped back for better protection of calculator.
- More legible % draft-per-hole scale.
- Vinyl plastic construction, resistant to wear, warping, dirt, perspiration, wire drawing soaps—can be cleaned.
- Still fits your vest pocket.
- Handy tables of W & M and B & S gauges.
- Feet per pound calculating scale for steel, copper and aluminum wires.
- Durable, accurate, easy to use.

The improved Crum Calculator is worth its weight in gold in time saving —no laborious mathematical calculations necessary when you use it. Instruction sheet with examples accompany each Calculator. You should have one or more in your wire drawing department.

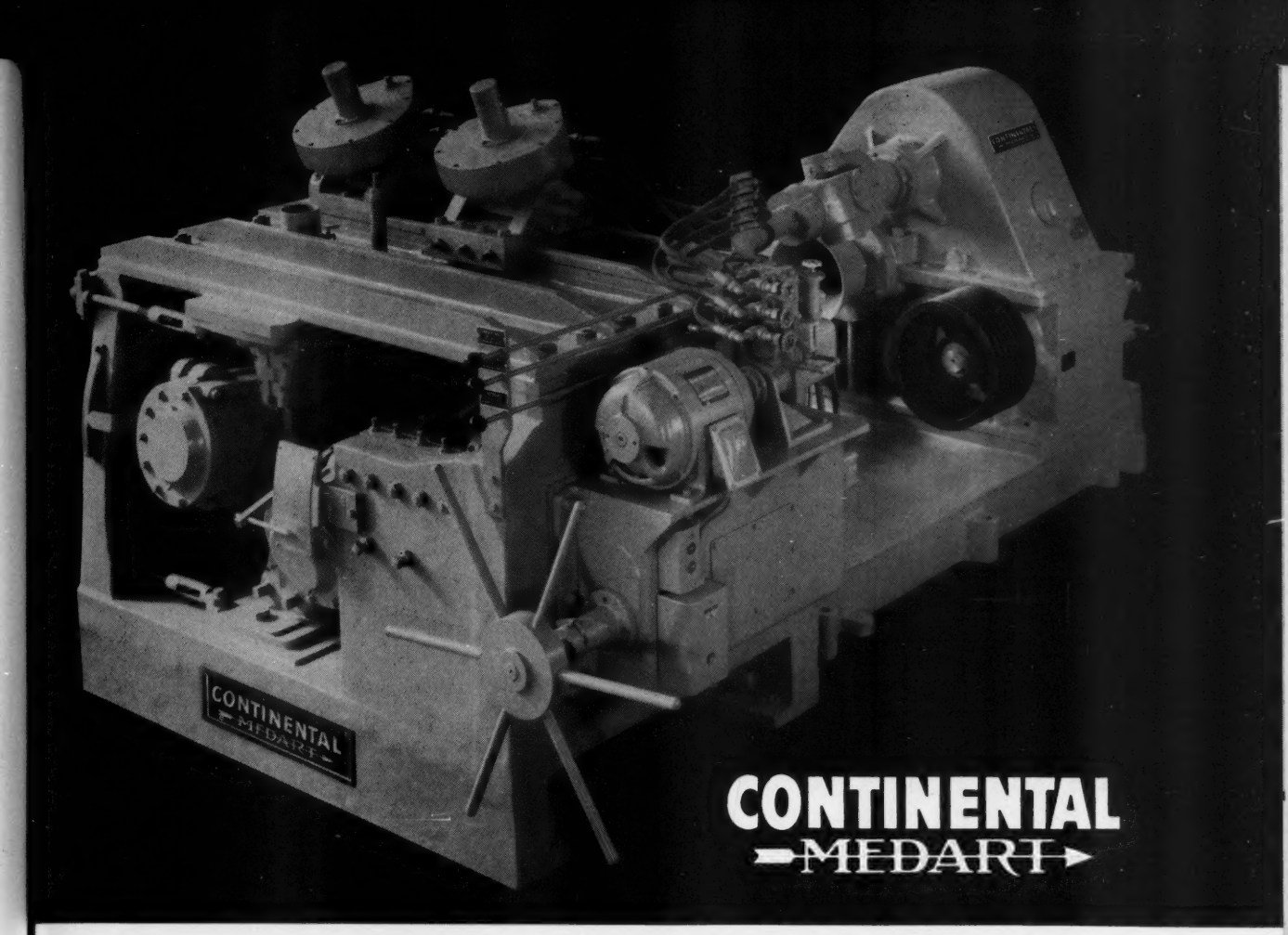
THE PRICE: $5.00 EACH

Send your orders to:

WIRE AND WIRE PRODUCTS

453 MAIN STREET **STAMFORD, CONN.**

(Exclusive distributors)



Input end of No. 3 Size 2-Roll Rotary, single motor type

Straightens, sizes and polishes round bars and tubing—*in a single high-speed operation*

that features new push-button roll adjustment

For quality of output, for speed and accuracy, and for production economy, the CONTINENTAL-Medart 2-Roll Rotary has become an industry standard for the straightening, sizing and polishing of bars, tubes and pipe. It is in a class by itself.

And here is why. The CONTINENTAL-Medart 2-Roll Rotary processes work pieces completely from end-to-end in long lengths or as short as 1". It produces an improved finish on hot rolled; imparts a *super-finish* on cold finished; straightens to within a few thousandths; corrects out-of-round and improves physical properties—all in one operation.

In this new and improved design, operation is continuous, uninterrupted. Feed through and discharge is entirely automatic. Setup time is cut down by unique push-button adjustment of roll angularity and pressure settings. Motors will reverse with material between rolls to permit additional passes for sizing and polishing. Throughput speeds up to 400 fpm and higher are attainable, depending upon the size, type and condition of material.

Built in ten different sizes to process rounds over the complete range from ⅛" to 10" diameter, the 2-Roll Rotary is now used in virtually every ferrous and non-ferrous mill on this continent. Why not have a CONTINENTAL-Medart representative show you what this equipment will do for you!

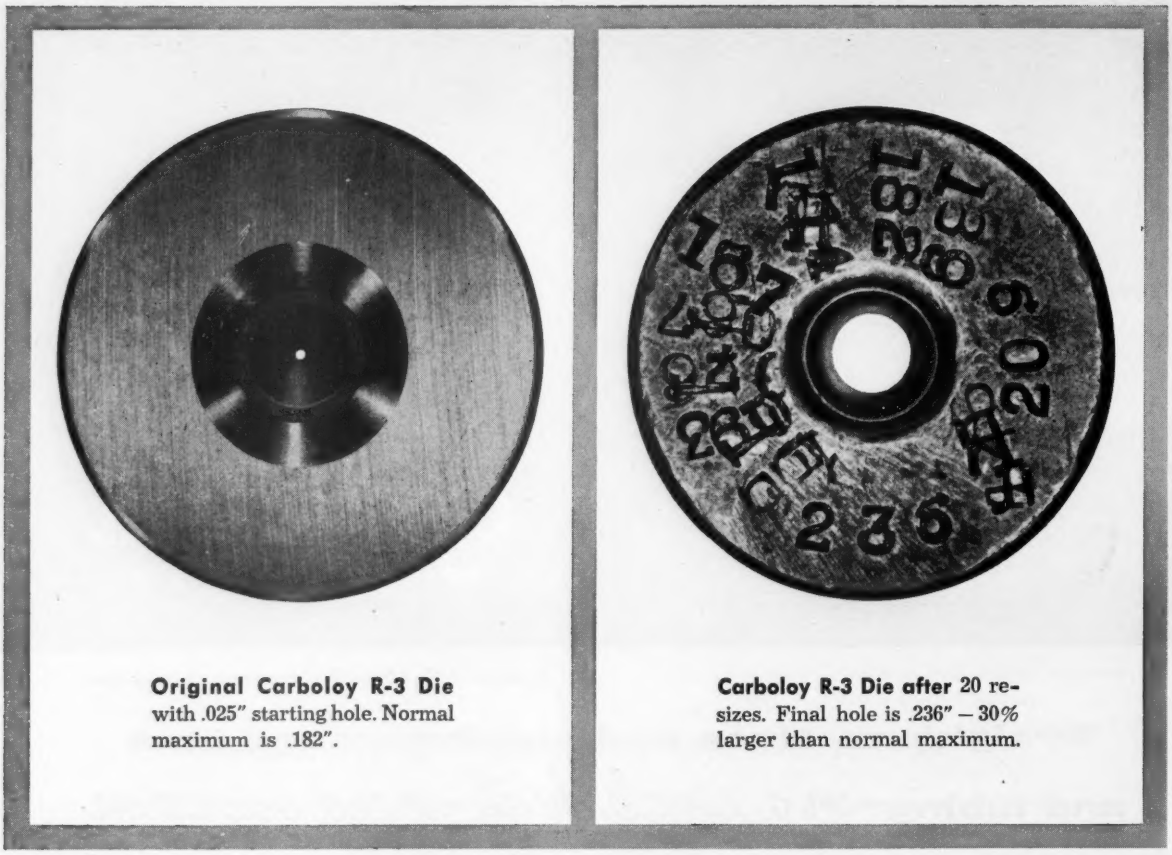
CONTINENTAL

Engineering and Sales Office, 220 Grant St., Pittsburgh 19, Pa.
***Plants at* East Chicago, Ind. • Wheeling, W. Va. • Pittsburgh, Pa.**
***Copes-Vulcan Division*, Erie, Pa.**

CONTINENTAL
Foundry & Machine
Company

Carbide wire-die user reports . . .

Carboloy R-3 Die resized 20 times



Original Carboloy R-3 Die with .025" starting hole. Normal maximum is .182".

Carboloy R-3 Die after 20 resizes. Final hole is .236" – 30% larger than normal maximum.

STARTING hole size on the Carboloy R-3 Wire Die, above, is .025"; the normal maximum is .182". But our Carboloy customer successfully reground the R-3 to .236" . . . 30% over maximum. Even after the twentieth resize, his wire had the same high quality and precision finish.

Longer die life and superior performance, due to Carboloy built-in quality, are but two of the money-saving "bonus" benefits you get – at no extra cost – with every Carboloy® cemented carbide Wire Die.

Others include: Immediate local delivery, in-plant engineering assistance, die servicing and finishing facilities, technical literature, and die training school for your personnel. Call in an expert Carboloy Wire Die Engineer, today. Or, write for Carboloy Die Catalog and Service Manual.

"Carboloy" is the trademark for products of the Carboloy Department of General Electric Company

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY
11171 E. 8 Mile Blvd., Detroit 32, Michigan

Carboloy Created-Metals for Industrial Progress

Quality Protected
...Costs Reduced
AT
SOUTHWIRE COMPANY
CARROLLTON, GEORGIA
They report that Elgin Diamond is easier to work with and results in a lower finishing cost per die. That's because Elgin Diamond is precision graded for particle uniformity and contained in a color-identified, lubricant-type vehicle. There's no waste, no mistakes, no loss of cutting efficiency. Why not protect your product's quality like others do . . . with Elgin Diamond.
ABRASIVES DIVISION
Dept. G
ELGIN NATIONAL WATCH COMPANY
ELGIN, ILLINOIS
ELGIN
DIAMOND
DYMONIC
ELGIN DIAMOND

Youngstown

BRIGHT BASIC COLD HEADING QUALITY WIRE

QUALITY YOUNGSTOWN SERVICE

This operator will tell you that Youngstown Bright Basic Cold Heading Quality Wire comes free of injurious seams and other surface defects. That's because Youngstown is a quality product—quality rigidly guarded step-by-step from open hearth furnace to finished wire.

THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon, Alloy and Yoloy Steel

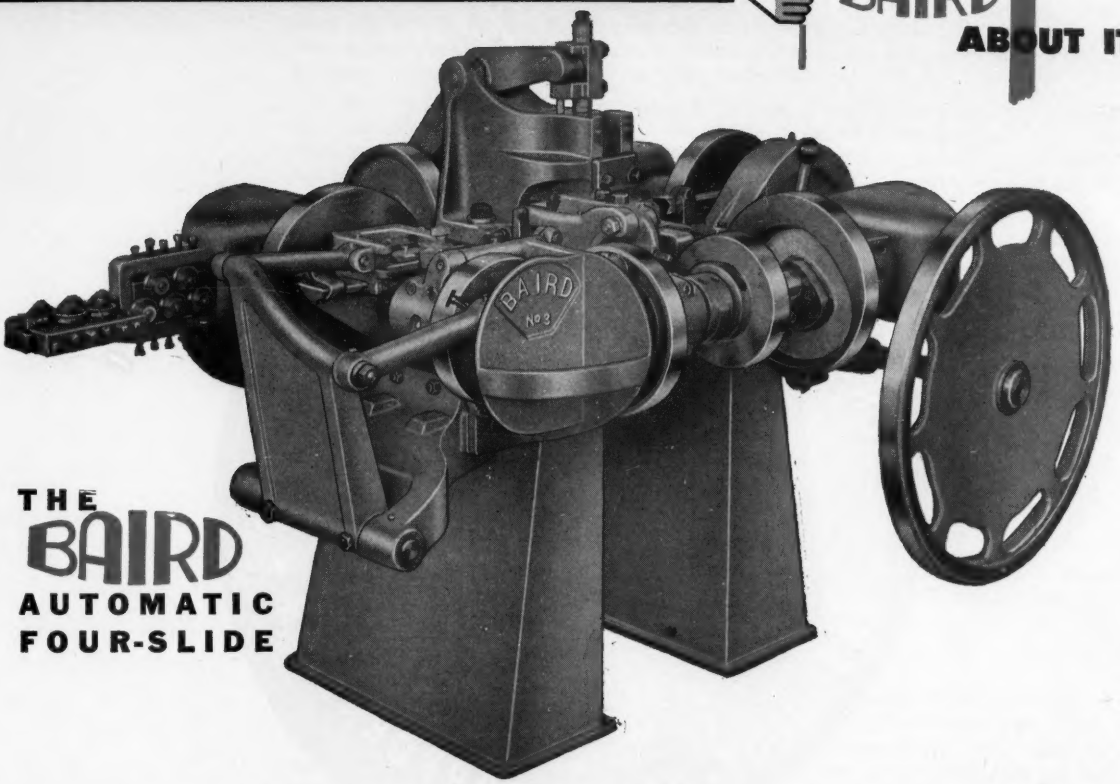
General Offices Youngstown, Ohio District Sales Offices in Principal Cities.

SHEETS - STRIP - PLATES - STANDARD PIPE - LINE PIPE - OIL COUNTRY TUBULAR GOODS - CONDUIT AND EMT - MECHANICAL TUBING - COLD FINISHED BARS - HOT ROLLED BARS - WIRE - HOT ROLLED RODS - COKE TIN PLATE - ELECTROLYTIC TIN PLATE - BLACK PLATE - RAILROAD TRACK SPIKES - MINE ROOF BOLTS

You are cordially invited to see
LATEST BAIRD MACHINES and TOOLING IN OPERATION
at the COLISEUM MACHINERY SHOW
Chicago Coliseum, Sept. 6-17, 1955 — **BOOTH 619.**

ASK BAIRD ABOUT IT

. . . IF IT'S A HIGH PRODUCTION PROBLEM . . .



THE BAIRD AUTOMATIC FOUR-SLIDE

NO MACHINE IN THE WORLD CAN MAKE A GREATER VARIETY OF PARTS . . . *OR PRODUCE THEM ANY FASTER*

Yet, new wire shapes, formed *by hand,* are continually submitted to us for tooling setups to produce them *automatically* on Baird Four-Slide Machines. We usually solve the problems.

Coiled wire is taken from a reel, is straightened, fed and cut off to the required length . . . then formed and ejected as a remarkably accurate part. The per-minute speed of production is almost unbelievable . . . and the unit cost likewise.

You may purchase your machine tooled for specific repetitive production, then add other tooling and attachments as required to increase the versatility of production of both wire and metal ribbon articles to the greatest degree.

Various sizes of standard machines give you a selection of wire lengths to 32½" . . . dia. to ½" . . . or flat ribbon metal products to 1½" wide.

Baird engineers will develop your tooling from your parts or from blueprints. The Baird Four-Slide Bulletin (Wire or Ribbon Metal) will open new avenues to low-cost competitive production. Your copy on request—write Dept. WP.

THE BAIRD MACHINE COMPANY
STRATFORD CONNECTICUT

WHERE YOU WILL GET THE HELP OF SPECIALISTS ON THESE ESSENTIAL PRODUCTION PROBLEMS:

AUTOMATIC MACHINE TOOLS • AUTOMATIC WIRE & RIBBON METAL FORMING MACHINES • AUTOMATIC PRESSES • TUMBLING BARRELS

3BA55

For the FINEST Dies...

Specify

There Are Many Reasons Why V-R Leads The Field!

V-R NEW Cylindrical nib and improved method of assembly insure high degree of concentricity.

V-R . . . First in producing the only Tantalum-Tungsten carbide developed specifically for Drawing Dies.

V-R . . . First to manufacture Carbide Dies with preformed rough cored back relief.

V-R . . . First to furnish Carbide Dies rough cored to finish at hole sizes below .010".

WRITE TODAY for NEW Vascoloy-Ramet Die Catalog VR-461.

The New V-R Die Catalog gives complete ordering information on all V-R Dies for drawing wire, rod, bar and tube.

Vascoloy-Ramet CORPORATION

893 MARKET STREET
WAUKEGAN, ILLINOIS

The Wire Outlook

The most disturbing aspect of the wire industry is the shortage of copper induced by the long-drawn-out strikes that reduced supplies to a critical point.

With the conclusion of a contract with the Kennicott Copper Corporation, along which general lines it is hoped that other producers will settle, production should be resumed on a full scale basis shortly. The effects of the strike, however, will be felt for months to come by copper wire and brass mills and insulated wire manufacturers. To add to copper consumers' troubles, it is now indicated that a smaller supply will be coming from Chile in the future.

The Washington action of releasing 5,750 tons of copper from stockpile supplies was likened to offering a drop of water to one dying of thirst, particularly as this release was earmarked for important military items. The strike lasted approximately two months and, for an industry working on low inventories, the curtailment of copper production was bound to be felt drastically.

New wage agreements throughout industry are leading to price advances on practically all metals, resulting in corresponding increases in finished product prices. There seems to be no end to the inflationary spiral, economists now predicting that gradual increases from year to year will be the normal outlook as long as the boom lasts.

Since business activity has gone beyond expectations and developed practically to boom proportions, the Government is now applying brakes in the form of a tightening of credit terms. These restrictions so far are aimed at money—mortgage credit, installment buying and interest rates.

Some question has arisen on stock market prices. Are prices too high? Probably anybody's guess is good, but it is interesting to note that the market has leveled off and for the past few weeks has been backing and filling, reflecting investors' beliefs that they are high enough.

One encouraging sign is the "Get Government Out of Business" amendment of Section 638 of the Defense Department Appropriation Bill, which gives the Department a free hand to curtail, abolish or transfer any activity that has been initiated in the last 25 years. Although bitterly contested by some, the Senate fortunately accepted the revision.

Fastener wire sales have responded to the general increase in business, some of the accretion in orders coming from railroads. Sales are up 16% over 1954. Manufacturers' wire demand is active, due to confidence in sustained good business. Automotive wire sales have been excellent. Merchant wire sales are ahead of last year, although baling wire business has been on a hand-to-mouth basis. Nail production has been high, with notable gains in aluminum nail sales. Wire for construction uses continue in strong demand. Wire rod supply is reported to be very tight, with production schedules filled through the third quarter.

Spring makers are going full tilt. There is some falling off in valve spring orders due to model changeovers, but demand for furniture, bedding and upholstery grades continue strong, with production through October assured.

On the political front, the New-Fair Dealers are desperate and can be expected to reach out for any straw of criticism of the Administration that will tend to curb the popularity of the President. They know that any direct attack on him would be almost certain to boomerang, so it is expected that they will attack his appointees and endeavor to keep business men out of government positions. What we have needed for many years is business brains in high places. We've had enough of impractical, inexperienced dreamers.

Our hearts go out to those of our industry in the flood devastated areas of Connecticut and Massachusetts, for not only are many mills badly damaged, but the personal privations and losses are beyond imagination.

It seems trite to say that business is good, but it is heartening after so many years to be able to feel an atmosphere of confidence throughout the country—and the world, in fact. We can't go far wrong if prosperity is general.

—from the Editor's Desk

LOWERED COSTS

IMPROVED DIE LIFE

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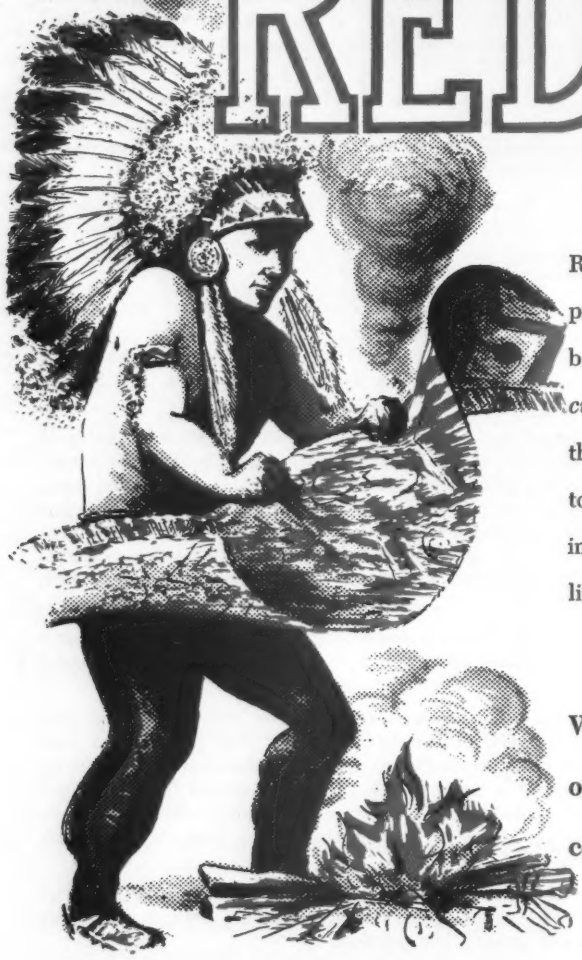

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Vol. 30 September, 1955 No. 9

A Modern Pickling and Surface Treatment Shop For Nickel Alloys and Stainless Steels

by Marcel Perret, Chief Engineer
Trefileries et Laminoirs de Precision Gilby-Fodor
Rueil-Malmaison (S. & O.), France

This article, describing a fine new plant, was submitted by Mr. Gabriel Fodor, Jr., Executive Vice-President of Gilby-Fodor. This French plant, in which stainless steel and nickel alloy wire and tubing are produced, is said to have the most modern installation in the world.

Introduction

The Trefileries et Laminoirs de Precision Gilby-Fodor have recently installed at their Rueil factory (S. & O.—France) ultra-modern equipment for the various surface treatments that are required in the processing of nickel alloys, stainless and heat-resisting steels in wire, strip, tubes and bars.

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The high resistance to corrosion by mineral acids of most of these products, such as nickel, monel, inconel, the cupro-nickels, nickel-chromium, nickel-chromium iron, and iron-chromium aluminum, resistance alloys, stainless and heat resisting steels, make their pickling and surface preparations very difficult.

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Pickling operations and surface preparations before cold working, must be made in very active solutions, the corrosive power of which makes necessary the careful selection of materials.

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The installations described hereafter have therefore been worked out to the smallest details to provide maximum resistance to liquid and atmospheric corrosion. General resistance to all chemical reagents has even been built into the majority of the tanks to provide more flexibility in their use following variations in production needs.

I
CHEMICALS USED

The only heat treatment used in this installation and functionally connected to surface treatment, is the annealing of wire and strip in a submerged electrode Ajax salt bath annealing furnace.

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This annealing operation is almost always followed by molten sodium descaling between 480°/520°C.

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The actual surface treatments use the main following liquid solutions:

Solution 1.
Hydrochloric acid—d = 1,19 ..... 30% volume
Nitric acid—d = 1,33 ..... 2% do.
Water ..... 68% do.
Temperature: 80°C.

Solution 2.
Sulfuric acid—65° Bé ..... 10% volume
Water ..... 90% do.
Temperature: 70 to 80°C.

Solution 3.
Sulfuric acid—65° Bé ..... 10% volume
Nitric acid—d = 1,33 ..... 0.5% do.
Water ..... 89.5% do.
Temperature: 70 to 80°C.

Solution 4.
Nitric acid—d = 1,33 ..... 15% volume
Hydrofluoric acid—at 70% ..... 2 to 4% do.
Water ..... 83 to 81% do.
Temperature 50 to 60°C.

Solution 5.
Sodium ..... 20% weight
Potassium permanganate 7% do.
Water ..... 73% do.
Temperature: 95 to 97°C.

Solution 6.
Nitric acid—d = 1,33 ..... 27% volume
Water ..... 73% do.
Temperature: ambient.

Solution 7.
Nitric acid—d = 1,33 ..... 20% volume
Water ..... 80% do.
Temperature: of ambient at 50°C.

Solution 8.
Alkaline solution at 12% in weight, with tensio-active sulfonated products.
Temperature: 95 to 97°C.

Solution 9.
Ammonium chloride saturated in water.
Temperature: 80 to 85°C.

Solution 10.
Complex containing sodium and lithium soaps and chlorinated waxes, in solution at 12% in weight.
Temperature: 70°C.

II

GENERAL DESCRIPTION

General Layout

The surface treatments have to be done at numerous stages of the wire, strip, tube and bar manufacturing; it was therefore necessary that these new installations be placed in a central position in relation to the existing workshops. This situation facilitates intercommunication and reduces handling, which is very important in an industry like this.

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The layout of the different treatment lines has also been planned with a view to providing the greatest possible proximity to the workshops to be supplied and the necessity of assuring handling connections between them.

Arrangement of the Treatment Lines and of the Handling Circuits

The idea was to arrange two distinct groups (A and B) of two parallel chains of treatment, one for the batches of coils close to the wire drawing plant and rolling mills, and the other one for the batches of tubes and bars close to the drawing shop.

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Aerial handling circuits have then been studied to feed the various stations of each chain, to permit communication between two chains of a same functional group and secure the supply and removal of products to their respective departments.

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The building itself based on these circuits has thus been custom built.

These general arrangements are schematized in Figure 1, where we can see:

(a) Line A^1 treating wire and strip essentially composed of tanks, of water rinsing stations, storing areas, drying ovens and a lead coating furnace.
(fed by bridges 3 and 3 bis).

(b) Line A^2 of heat treatment, including salt bath furnaces with their quenching tank and an independent installation for annealing coils in a sealed pot Grunewald furnace.
(fed by monorail 4).

(c) Line B^1 of surface treatment of tubes and bars including 4 tanks and a drying oven (fed by monorails 1 and 1 bis and by a bridge forming, at the end of its course, a link between the latter).

(d) Line B^2, group of 3 tanks constituting an extension of the surface treatment of tubes and bars which it has not been possible to group with Line B^1 for lack of space.
(fed by monorail 6).

Figures 2, 3, 4 and 5 give a general view of the several groups.

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The connections between the various circuits clearly appear in Figure 1; they are largely facilitated by the use of electrical interlocks at the end of the beams, permitting a very precise automatic stop of the latter in front of the monorails and a quick passage of the cranes from one to the other.

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The general description of this arrangement thus shows the prime importance that we have given to handling, as it represents the principal factor of efficiency in a technique consisting essentially of immersion, by successive steps, of loads in various tanks distributed according to determined cycles.

Role of the Gallery

The schematic cut of the general installation seen in Figure 6, shows a central gallery entirely closed and against which are placed, with adequate expansion joints, surface treatment tanks of Lines A^1 and B^1.

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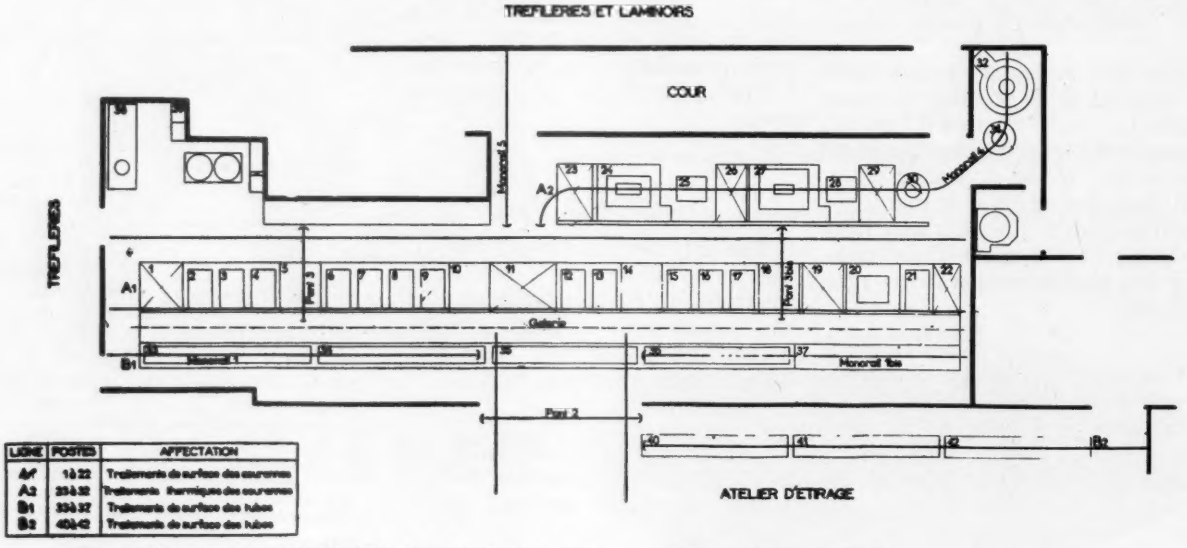
This tunnel, which distinctly separates the coil line from the bar line was erected with the following quadruple aim:

—To support the fume exhaust duct;



LIGNE	POSTES	AFFECTATION
A1	1 à 22	Traitements de surface des couronnes
A2	23 à 32	Traitements thermiques des couronnes
B1	33 à 37	Traitements de surface des tubes
B2	40 à 42	Traitements de surface des tubes

Fig. 1. Schematic plan of the treatment lines and handling circuits.
—Storage area: 1-11-19-22-23-26-29.
—Surface treatment tanks: 2-3-4-6-7-8-9-12-13-15-16-17-33-35-36-40-42.
—Rinsing stations: 5-14-34-41.
—Drying oven: 10-18-37.
—Quenching tanks: 21-25-28.
—Furnaces: 20 (coating)—24 (AJAX)—27 (descaling)—30-31-32 (GRUNEWALD).

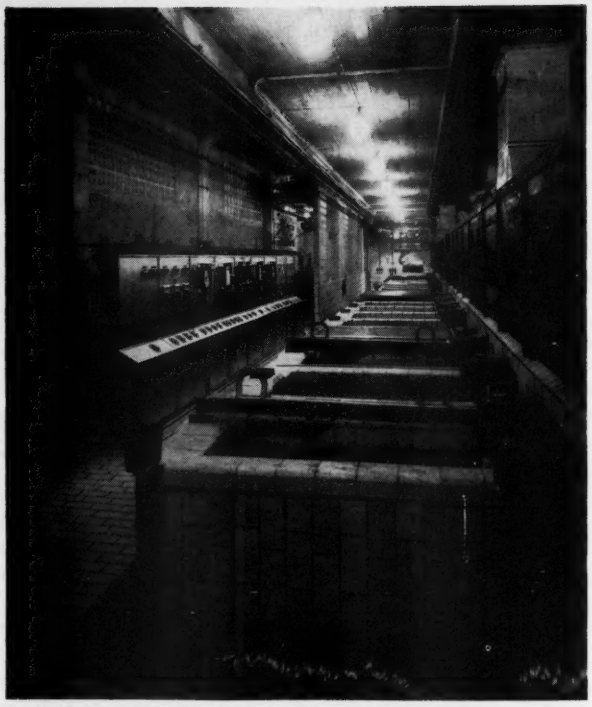


Fig. 2. General view of line A, for wire and strip treatment.
—On the left: control panel. * * * * * * * * *

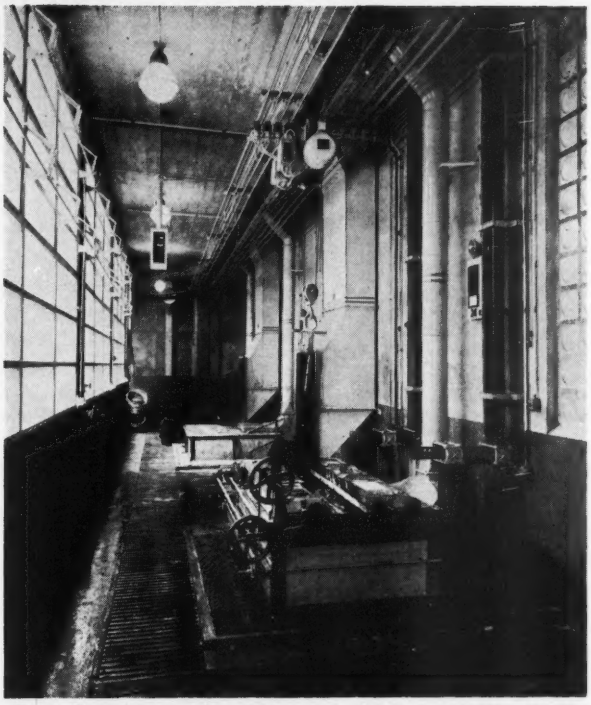


Fig. 3. General view of line A^2 for wire and strip heat treating in coils.
—On the front plan: Ajax furnace. * * * * * * * *

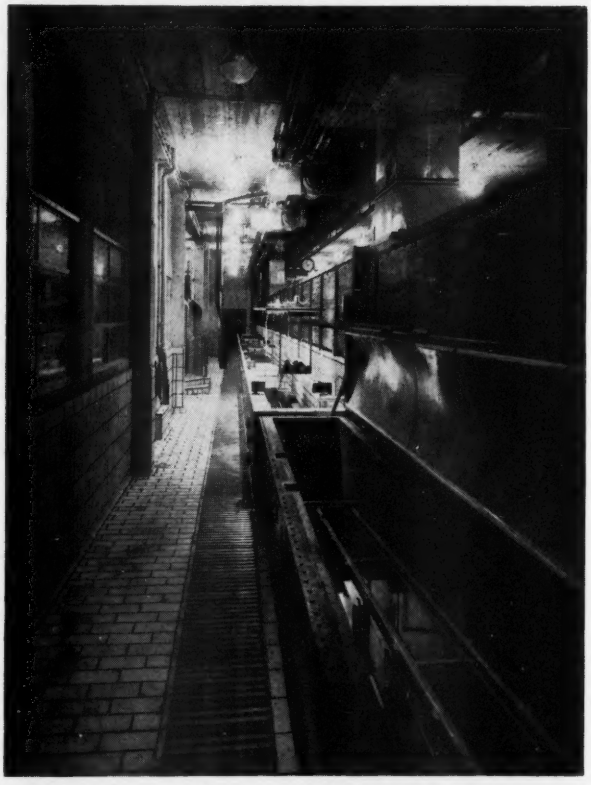


Fig. 4. General view of line B for tube and bar surface treatment.
—On the front: drying oven with opened cover. * * * * *

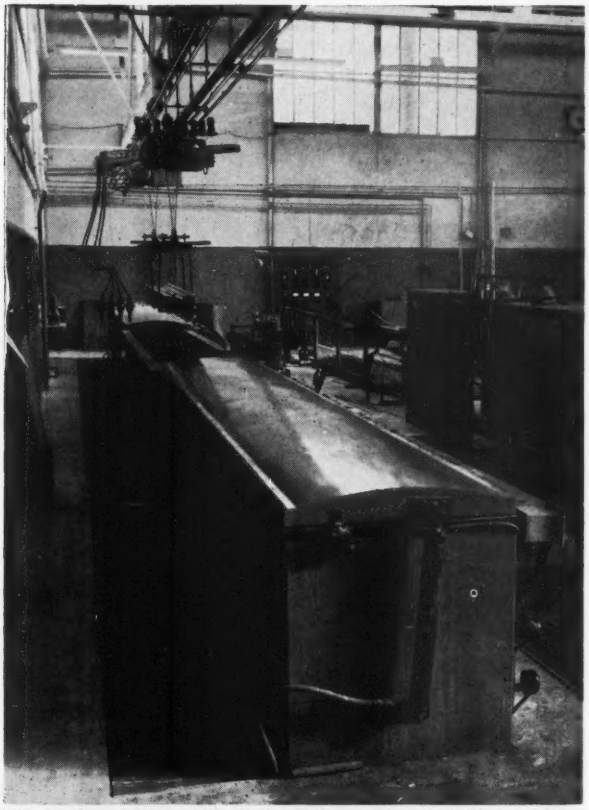


Fig. 5. General view of line B, for surface treatment of tubes and bars.

—To centralize distribution and control circuits of the various fluids;
—To collect rinsing or residual waters originating from adjacent conduits, tanks and gutters; and
—To permit easy access to the rear of the drying ovens and of the leading furnace on which have been grouped the heating and control devices.

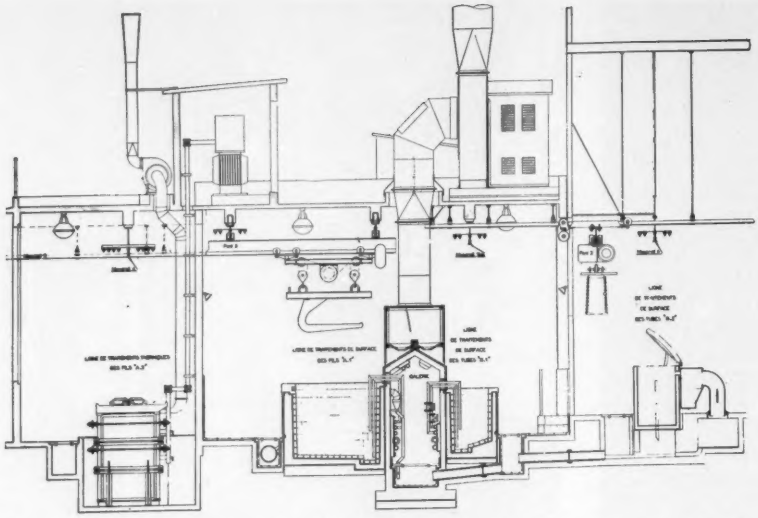


Fig. 6. General diagrammatic section of the installation. * * * * * * * *

Building Design

The need to place all the ventilators and electrical equipment outside induced us to erect a flat roofed building, as indicated in Figure 6.

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Reinforced concrete was chosen on account of its excellent resistance to corrosion while, on the other hand, it permits easy location of the rails of bridges and monorails.

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Longitudinal beams, the only ones visible from inside, have been placed where handling circuits are; this uninterrupted line undeniably contributes to the attractiveness of the building.

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As shown on Figure 4, two of these bridges outline a skylight in the principal workshop, which is obstructed only by the transverse beams and the exhaust ventilators.

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A partition separates lines A^1 and A^2, which have very different functions and marks the limit of an anti-acid protection which was unnecessary in the heat treatment shop.

III

SPECIAL DETAILS

Having thus traced the general lines of these installations, we will give the principal characteristics as well as certain details of design, of building and use, which gives this unit its originality.

Foundations

Reinforced concrete construction of the various tanks placed on each side of the central gallery and coated with anti-acid bricks, has been the object of special care to make sure that no deformation will occur. To this end, very thick walls and armoring have been calculated, while Isorel expansion joints of 10-20 mm. have been placed around each tank to make them totally independent of other tanks in the gallery and from gutters, pits and contiguous floor space.

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It is thus impossible that a gap will occur in the brickwork due to a deformation of the support.

Handling

Referring to Figure 1, it is interesting to describe technical characteristics adopted to assure handling of the various products according to assigned circuits.

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(a) Line A^1. Two traveling cranes, Nos. 3 and 3 bis of 500 Kgs. maximum load circulate on the two common tracks, the pendular suspension of which permits, in connection with the sliding system of the head of one of the beams, to avoid all jamming.

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The hoists equipping these beams can, thanks to electrical locks, pass on monorails 4 and 5 respectively supplying the interior yard and the heat treatment shop.

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The coils are handled with hair pins, sometimes quadruple for small wires, permitting a continuous load of 4 feet per arm.

★ ★ ★

The need to balance the load distribution and assuring absolutely parallel movement of these pins to place them readily into position in the tanks, caused us to install hoists with double cables, equipped with special hooks with constant spacing so that hooking and unhooking operations may be remote controlled easily.

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With a view to simplifying the work, a stop on the beam limits the range of the hoists toward the gallery, so that there are only two coordinated movements of adjustment, instead of three, for putting the hairpins in position in the brackets.

★ ★ ★

Strong flood lights facilitate examination of surface conditions.

★ ★ ★

All these arrangements are shown in Figure 7, where we can see the three controls for the movement of the crane (23 m/min.), the driving of the hoists (23 m/min.), the raising or lowering (4.75 m/min), the electrical lock and the lighting.

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Finally, it should be pointed out that the direction of opening of the pins is towards the gallery to permit loading and unloading on the floor of batches of coils through the movement of the hoists. The handling is made possible by 4 storage spaces within the 3 principal heat treatment groups.

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(b) Line A^2. Independently of hoists Nos. 3 and 3 bis, which may supply intermittently all points of

monorail No. 4, a crane moves normally on this track, at the two ends of which there is a remote control.

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This detail is designed to protect the workman from any molten salt projections occurring when immersing loads in salt bath furnaces and when quenching them.

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A system of visual signals, shown on Figure 3, indicate to the worker the stopping position above each tank and thus allows him to determine from a distance the zone of work of the handling equipment.

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(c) Lines B^1 and B^2. The connection between these two parallel lines of treatment, placed on each side of a partition, is made by a long sliding suspension bridge (6 m.80) of 500 Kgs maximum load and on the bridge of which moves a train of 2 connected hoists, the electrical lock permits movement on monorails 1, 1bis and 6.

Loads of a maximum length of 7 meters are slung on special supports attached to the hooks of the hoists. This mode of suspension, shown in Figure 4, avoids oscillation of products and falls on account of shifts in their centers of gravity.

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All other characteristics being identical to those of beams 3 and 3 bis, the independent hoisting control (8.50 m/min.) on each furthermore permits the tilting of the loads, which facilitates air extraction from the interior of the tubes at the time of their immersion and the discharge of liquid upon withdrawal from the tank.

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Let's finally point out that the opening of 7 x 2 meters in the partition separating lines B^1 and B^2 is operated by electrically controlled panels permitting the complete isolation of the principal surface treatment, as far as ventilation is concerned.

Ventilation

In the various treatment operations being made in baths where strong acid solutions are used, it is essential, for the protection of personnel as well as for protection of the building, to exhaust these corrosive vapors before they disperse. The heating of tanks and the preponderant use of acids with high vapor tension, such as HCl and HF, make this ventilation very necessary.

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Installations vary according to the treatment lines connected.

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(a) Principal surface treatment and pickling shop. The diagrammatic section of Figure 6, as well as Figures 2, 4 and 7, clearly show the ventilation principle.

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The tanks, placed in two parellel rows on each side of the gallery, are equipped with a wooden exhaust with openings placed above each one of them. The section of these slots, as well as the air

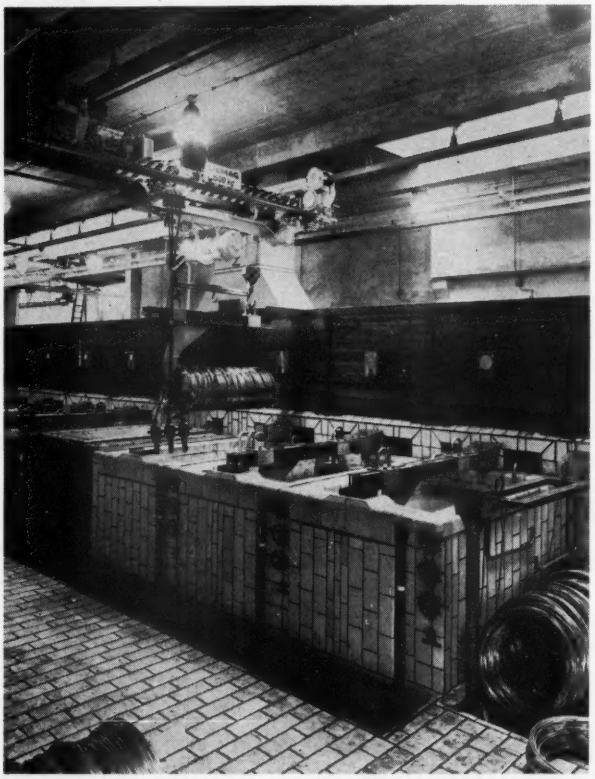

Fig. 7. Partial view of the coil treatment tanks showing dispositions adopted for the handling, the ventilation and the fluid feeding.
—On the extreme left: a rinsing tank. * * * * * * *

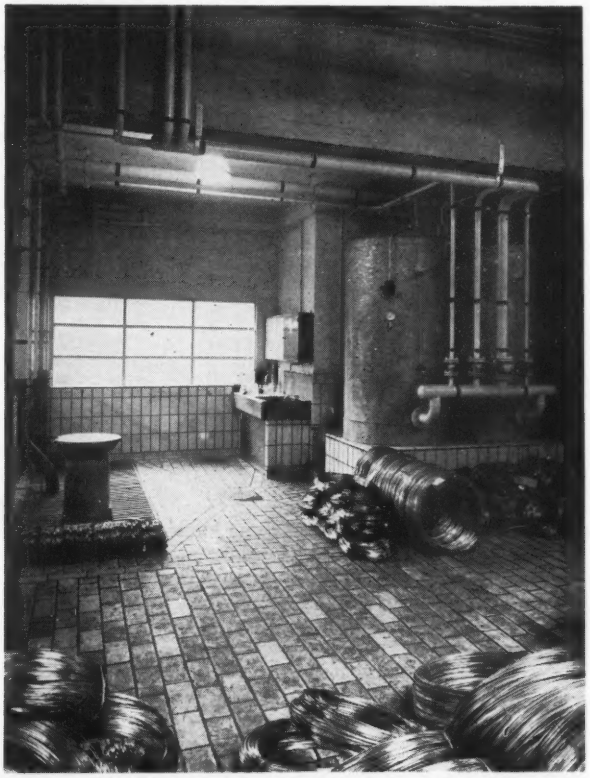

Fig. 8. General view of water accumulators of intermediate water tanks and of preparation of soda water and of the chemical control station.
—On the left: feeding hopper for soda ash. * * * * * *

speed, 18 to 20 m. sec., on the average, are regulated for each bath, according to the importance of the fumes, by varying the height of the openings and the position of the inside setting.

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Two ventilators running under a total pressure of 75 mm. C. E. with a total output of 2,100,000 cu ft/h are placed on the roof from which they are isolated by vibration absorbing blocks. Another group with an output of 370,000 cu ft/h, the extra exhausting duct of which has an opening in a special part of the manifold, ventilates the lead coating furnace 20 and its quenching tank 21.

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This high volume is important to health conditions, as it makes possible the exhausting into the atmosphere of air with an extremely small acid concentration. Thus the air of this shop is renewed 74 times an hour. It is introduced through the chassis of the skylights placed above the exhaust openings, so that the turbulence only slightly affects the zones where the operators work. The latter are, besides and for this reason, heated during the winter with infra-red radiant heating panels.

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The thorough collection of all the fumes is made easier in the coil tanks by nozzles, fixed in their walls, blowing a stream of air towards the exhaust manifold with a speed of 40 ft./sec.

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Attention should be drawn to the double incline of the roof of the gallery for the drainage of condensates back to the bath.

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(b) Heat treatment shop. The ventilation equipment of this shop deserves mentioning only as far as the water quenching tanks serving the two salt bath furnaces are concerned. While the latter are equipped with standard centrifugal ventilators, the first ones are ventilated by helicoidal exhausters with a large output of 170,000 cu ft/h. each, running under a small pressure of 10 mm. C. E. and which are the only ones which can blow out instantly the quantities of water vapor generated when quenching the coils.

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Figure 3 shows the large dimensions of the suction hoods above tanks of reduced size permitting, together with a low water level, the better canalization of the columns of water-vapor before their collection.

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(c) Appended surface treatment line for tubes and bars. Two tanks are heated at high temperature, which justifies their covers and special ventilation system. As shown in Figures 5 and 6, a line of nozzles throws out the steam in the rear manifold which communicates with an underground collector. A valve placed in the extraction duct synchronized with the cover movement permits reduction of ventilation at the closed position, thus minimizing heat losses.

Fluid Distribution

This subject is only interesting with regard to the principal treatment workshop where the installations show a certain originality.

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The feeding of fluids of the double line of tanks is assured by layers of main pipes covering the internal walls of the central gallery and carrying among others:

—Water necessary for the baths,
—High pressure rinsing water,
—Steam for heating, and condensed waters,
—Drainage water,
—Soda water for draining and neutralizing,
—High pressure oil for hydraulic Jacks,
—Air for agitation in certain baths,
—Propane gas.

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Tappings are made on these main pipes, at the back of each tank, which is equipped with valves for regulation. They cross the gallery walls through suitably placed holes and lead into the tanks.

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This detail, which was shown on schematic plan No. 6 and which can be more clearly seen in Figure 9, has the advantage of centralizing the circuits in an easy to reach area, protected from corrosive fumes and acid splashings. The distant position of the valves rendered their remote control necessary, which was done by introducing shafts in the walls of the tanks with exterior handwheels placed in recesses (See Figure 7).

Fig. 9. Interior view of the gallery showing disposition of circuits of fluid distribution.

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This exclusive utilization of the gallery for fluid distribution can be considered one of the main factors contributing to the neatness and originality of this installation.

Importance of Rinsing

Among distribution circuits, particular importance has been given to water for rinsing which caused the installation of a high output pump (1.400 cu ft/h) putting water under 1,000 lbs/sq. inch pressure in two cylinders of a total capacity of 1,300 gallons, which can be seen in Figure 8.

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This device feeds 3 rinsing stations, one for the tubes and bars and two for the coils.

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This operation, which is frequently renewed in a treatment cycle, is of great importance in pickling because it removes the sludge and residual film of salts which stay on the metal after descaling.

Bath Neutralizing—Draining System

This operation takes place ac-

cording to a somewhat original procedure , schematized in Figure 10, and which first of all was promoted by our desire not to create, with a drainage-hole, a dangerous solution of continuity in the complex brickwork of the tanks.

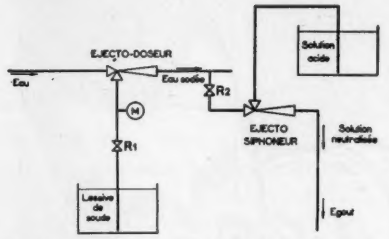

Fig. 10. Schematic presentation of the system for neutralization-discharge of used acid baths.

The acid solution to be drained is drawn out by means of a siphon tube, an ejecto-siphoner fed with soda water, previously prepared in a first ejector-feeder with a soda solution and water under pressure.

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Acid neutralization is thus combined with drainage, the pH of residual liquid being regulated between 7 and 9 by action of the valve R1 which operates flow of soda water. A simple system, by which water under pressure directly feeds the ejecto-siphoner, is used for the drainage of rinsing and alkaline water.

Electrical Equipment

The essential characteristics of the electrical installation of these treatment lines is the remote control, from a switchboard which can be seen on Figure 2, with all switch gear placed in two booths on the roof.

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These details, which have been provided to avoid corrosion, have the advantage of a favorable centralization for the maintenance of the circuit breakers and protection devices and the supervision of regulation, control and signaling devices.

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It is interesting to mention clock equipment for weekly regulation, for the automatic control of the boiler, the heating of tanks and the various furnaces and ventilators. Independently of controlling switching automatically outside working hours, the particular interest of this equipment is that it allows intermittent working (5 m. in 1 or 2 hours) of the ventilation of the main shop during the nights or week-ends.

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Absence of heating with acid baths, in fact, does not exclude emanation of corrosive fumes and it is therefore valuable to periodically renew the air in the shop.

Heat Treating Equipment

The three drying ovens for coils and tubes only need to be mentioned for their vertical loading, comparing them to tanks from the point of view of handling, and the three leading, descaling and Grunewald furnaces for their "Tophet A" Ni-Cr. resistance equipment. On the other hand more importance should be given to the Ajax furnace shown in Figure 3. This furnace is a submerged electrode salt bath furnace with 4 pair of Inconel electrodes and 180 KW power, used for annealing, between 1.050-1.200°C, of coils of wire and strip in resistance alloys and stainless steels. Its lay-out, shown on diagrammatic Section No. 6, is such that it is fed low tension current by bars coming down directly from the transformers on the roof.

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Compared to heating in an open furnace, this salt bath treatment has the following advantages:

—Great heating speed,
—Surface protection against oxydation and carburization, facilitating ulterior pickling.
—Possibility of obtaining uniform higher temperatures,
—Superior production capacity, with same power, exchange of calories not being hindered by passage through a crucible,
—Great flexibility.

Chemical Control Station

A chemical control station, shown in Figure 8, has been arranged to permit systematic control of solutions on the spot. Results indicate daily the quantities of acids and products to be added to maintain the proportions of active constituents within narrow limits.

Dissolved cations are also dosed to see if a bath must be kept or discarded.

IV
SELECTION OF MATERIALS

If it is undeniable that the relative arrangement of the various treatment sections and their rational supply are fundamental parameters which regulated the general conception of the installation described. The search for the most favorable conditions in the struggle against corrosion has also been another determining factor.

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In practical realization, this principle became exclusive, because a sound choice of materials was the only thing that could assure the long life of these shops.

Ceramic Materials

As previously shown in the figures, the tanks, the gallery, the floors, the ducts, grounds and low parts of the walls have been entirely covered with bricks or sandstone slabs.

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Independently of the interior tank walls containing the treatment bath, acid resisting lining of other parts of the principal installation was necessary for the protection against dripping, splashing and condensation.

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The techniques of anchoring the ceramic materials used depended on the work to be done and of the reactives employed. They essentially consist in placing on the concrete base the three following successive layers:

(a) Impregnation and waterproofing layers, the latter with a polyisobutilene base for tank walls and of a tar material for the other parts;
(b) Laying mass of anti-acid bricks, with a base of: bitumen for all surfaces which do not hold acid permanently; special concrete (potassium silicate or synthetic resin), which vary for tank interiors according to the solution used is acid or alkaline;
(c) Anti-acid ceramic bricks with less than 32% aluminia, or graphite with less than 1% of ash,

(*Please turn to page* 1063)

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by P. P. Somerville
Plant Manager, Wire Rope Division
Jones and Laughlin Steel Corporation
Muncy, Pennsylvania

The manner in which this plant has been improved continuously is described in this article, which is published in the expectation that it will be of interest to many of our readers.

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★ ★ ★

We have made it a policy to strive constantly to improve manufacturing techniques to not only cut down operating costs, but also assure the production of consistently high-quality products.

★ ★ ★

From the time the wire is received from the company's Aliquippa wire mill, until the final inspection of the wire rope before shipping, all of the material handling at the Muncy plant is completely mechanical.

★ ★ ★

Improper storing or handling might cause oxidation of the wire that was perfect when it left Aliquippa. Such oxidation would result in a reduction in both tensile strength and fatigue properties of the wire.

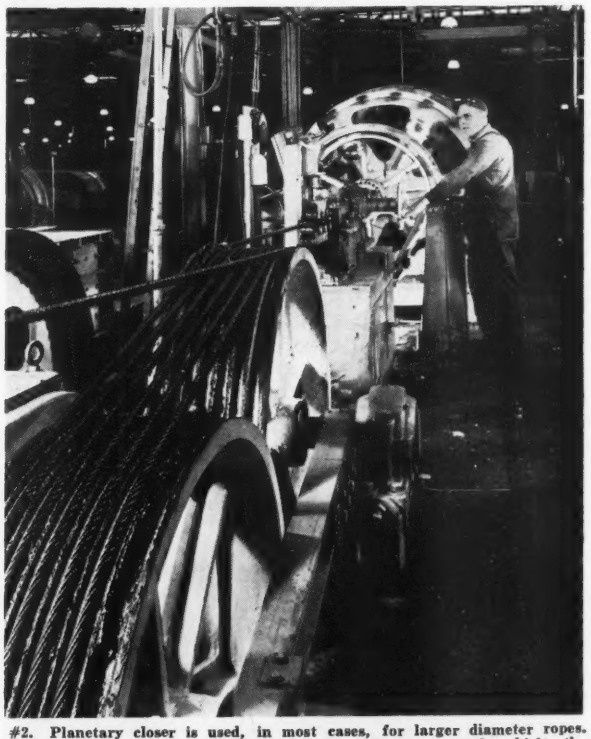
★ ★ ★

Wire in various diameter sizes and grades arrives at the Muncy plant by rail or truck and is unloaded onto steel-framed pallets. These pallets are placed in an aisle and an overhead monorail crane lifts them, weighs the wire and puts it in stock. The craneman who weighs each pallet records that weight, the size and the grade of wire on an inventory control card, which is carried in a card holder on the pallet.

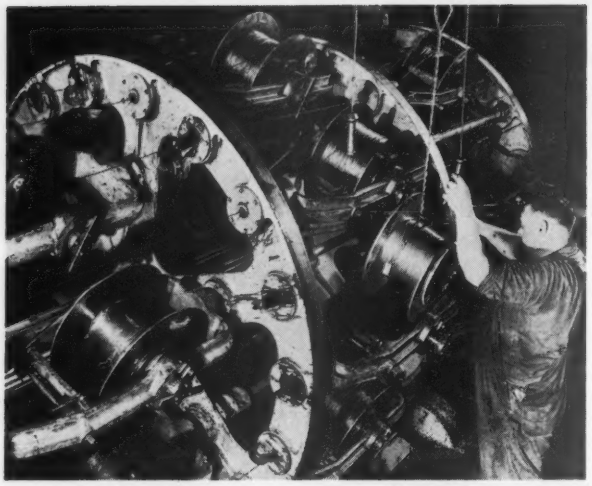
★ ★ ★

Then when an order is received by the craneman, he picks up the wire, delivers it to the winders, and notes on the inventory control the amount of wire taken from the pallet by the winder. A

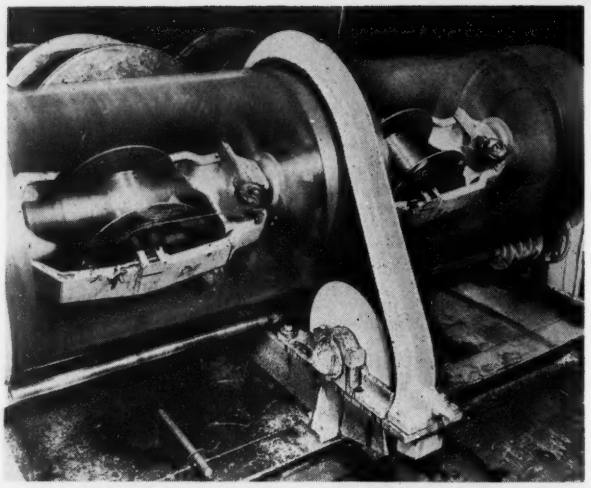
#1. Stranding machines in operation. The smaller machines can revolve at speeds as high as 7,200 rpm. Average speeds run about 1,000 rpm. Some stranders are 200 feet long and introduce tremendous torsional problems. Balance is all-important to accurate stranding, so long stranders are broken down into smaller sections and boted together.



#2. Planetary closer is used, in most cases, for larger diameter ropes. Closer spins in the background. The drums around which the rope travels before being wound on a reel keep rope in regular line, exert straightening and setting force on the rope. Planetary machines predate the tubular stranders and closers. They do not operate at the high speeds of the tubular machines.



#3. Planetary strander for making strand, or rope. Spools of wire from the winders are placed in position on the strander and threaded through the holes into a forming die. The machine rotates, pulling wire from the spools into the die.



#4. Close-up of a tubular strander in operation. Although the operation of these machines might seem dangerous, the plant has worked more than 2½ million man-hours without a lost time accident, has never had a fatality.

running inventory thus is kept in this manner.

★ ★ ★

In co-operation with engineers from General Electric, the plant management at Muncy has worked out an electronic control system for spooling wire which has increased efficiency without taking an additional inch of floor space in the winding department. The company is now able to wind wire on bobbins so rapidly that if it doubles its stranding and closing capacity it will not have to change the winding operation at all.

★ ★ ★

A new control system was devised to remedy a condition that was caused by all bobbins in one line being turned from a single power source. The main problem was that the speed at which a bobbin must turn to wind wire most efficiently on an empty spool would be too fast as the amount of wire on the spool increased. Consequently, it was necessary to wind wire at the lower speed, regardless of the sacrifice of efficiency.

★ ★ ★

In the present system, an electric motor turns the bobbin, which pulls the wire from the rotating swift. The swift is belted to a generator which puts a constant drag on it. Thus the current generated by the rotation of the swift activates electronic relays which vary the power to the motor driving the bobbin, resulting in maximum efficiency throughout the winding cycle.

★ ★ ★

When a coil of wire runs out before a bobbin is filled, a fresh coil is buttwelded to the expended coil. This job is done by a Micro buttwelder. However, such a weld is brittle, so the wires must be annealed at the spot where the weld is made. This is performed in a small annealing trough.

★ ★ ★

Plant Manager Somerville has adopted a policy of having every machine completely overhauled at frequent intervals. As part of this policy, the engineers, mechanics and operators try to incorporate a major improvement in the machine before it is reassembled, based on previously noted shortcomings or possible improvements.

★ ★ ★

This "improvement" policy can be seen in every stranding machine at Muncy. Stranders are the first machines used in making wire rope. Threading of the stranders is done on the outside of the tube of the machine, rather than on the inside, as is the case with other equipment of this type.

★ ★ ★

This outside threading—unique in the industry—makes it virtually impossible for a broken wire to get through on a strand. When a wire breaks on a strander at Muncy, it is thrown by centrifugal force against an electrical conductor, which in turn breaks a circuit and shuts off the power to the machine.

★ ★ ★

Tubular stranders rotate at terrifically high speeds—some as high as 7,200 revolutions per minute, although average speeds are considerably less than this. Since, in some instances, these tubes are more than 100 feet long, torsional and alignment stresses are introduced that are of concern to the wire rope manufacturer.

★ ★ ★

At Muncy, the long tubular stranders have been broken up into smaller lengths and joined together with a flexible connecting member. This has been found helpful in reducing alignment and balance problems.

★ ★ ★

Strands are formed into rope on closing machines, some similar in construction to the tubular machines on which the strands are formed. Other machines, used in most cases to make larger diameter ropes, are the planetary closers. With these, the bobbins of strands are mounted so that they revolve about the center axis of the machine as they feed into a forming head or die.

(*Please turn to page* 1065)

Butyl Polymer Compounding for Insulations

by Emil W. Schwartz, Technical Service-Sales Dept.
Southern Clays, Inc.
New York, N. Y.

A paper presented at the Third Annual Wire and Cable Symposium on December 8, 1954 at Asbury Park, N. J., sponsored by the Signal Corps Engineering Laboratories, Fort Monmouth, N. J.

It is well known, at this time, that butyl polymer is an excellent "dielectric", in that compounds made of it give unusual ageing, a fine degree of heat resistance and excellent stability in electrical values when measured in such terms as insulation resistance, dielectric constant and power factor in dry or even wet locations. The electrical values may be inter-related to its excellent resistance to water absorption. We consider butyl compounds, when properly mixed and processed, to have the lowest water absorption of any of the present vulcanizable polymers.

★ ★ ★

It has been said by some engineers experienced in the wire and cable industry that butyl insulations will be one day the only rubber compound made, and that the other polymers will be used for other uses in the rubber industry. This type of statement is highly controversial in that no one knows five years from today what type of polymers will be available, with the very excellent technical progress being made with new polymers and improving some of the old ones. What we can assume from all this is that butyl insulations are being taken seriously by the engineer and chemist in the wire and cable industry, and likewise are important to the engineers who purchase and install insulations for its many uses.

★ ★ ★

The purpose of this paper, therefore, is to outline, in a very practical way:

(1) Standard "Base" formulations
(2) Methods of mixing and accelerating these formulations
(3) Results obtained by following outlined procedures

Actually this paper deals with two premises which seem standard in insulation procedure:-

(1) The exclusive use of R-35 polymer
(2) The quinone derivatives with red lead as the curing system.

★ ★ ★

Not wishing to oversimplify the problem, it will serve our purpose to classify the use of butyl insulation into two broad branches:

(1) Low voltage use.
Typical of this application is the tentative specifications of Underwriters Laboratories for Type RH-W, 600 Volts, 75°C use, where low water absorption, heat resistance, ageing and stability of insulation resistance in 75°C water is needed.

(2) High voltage use.
Insultation, principally corona resistant, to meet Insulated Power Cable Engineers Association, known to all of us as IPCEA, specifications.

Base Stock	Low Voltage	High Voltage
GR-I 35	100	100
Zinc Oxide	5	5
Whitetex #2	130	117
F T Black	5	9
F F Black	-	9
Sulfur	0.15 - 0.20	1.5
Polyac	0.15	0.15
Paraffin	3	3
Sun Check Wax	2	2
Softener	5	5

You will notice that the base stocks are slightly different, principally because the acceleration used is different. This approach will be explained as we delve further into this compounding problem. The ingredients used in these formulae are listed in this paper for reference.

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The principal filler in these compounds is Whitetex #2. This material is derived from a highly water washed, purified kaolin, purged of all grit such as mica, silica and water solubles, and then so treated that the combined water of crystallization of the kaolin is practically eliminated. This then, is no longer a clay, but technically is a complex silicate. In these formulae it gives good processing stocks with very smooth extrusion properties. Aside from this, it gives low water absorption values and stable electrical results.

Mixing

We endorse the work, and very positively so, of (1) **A. M. Gessler, R. L. Zapp, F. P. Ford** and **John Rehner, Jr.**, concerning the high temperature processing of butyl polymer.

★ ★ ★

While these series of very excellent papers deal principally with carbon black, the fundamentals evolved apply to non-black compounding for insulation stocks. By practical experience we have found these stocks to have much better dispersion, more density after cure and to give smooth extrusions. The old evils of rough and horny extruded rubber, high swell after stock leaves the tubing die, and porous vucanizates are virtually eliminated by high temperature mixing.

★ ★ ★

The mixing procedure is listed below.

Internal Mixer - Ranbury #3-A - Slow Speed
Batch Weight - 163 lbs. - Batch E

Minutes	Additions	Chart Temperature °F
0	R-35	225
2	½ Whitetex #2, ZnO, Black, S	225
4	Balance of Fillers	235
8		235
9		270
10		280
11	Add Polyac	295
12		315
13		325
14		340
15	Add MB Red Lead, MB Altax	355
17		390
18	Add Waxes, Softeners	395
20		400

No cooling water used for mixer
Dump on Sheeting Mill, Strain

If the internal mixer is cold, would recommend the use of steam on rotor to get temperature up to 225°-250°F.

(1) Rubber Age, Vol. 74, No. 1, 2, 3, 4

While the approximate gravity of base stock is 1.45 and the theoretical weight, as estimated by volume, should be 125 lbs., we have found the batch weight for best mixing to be 163 to 165 lbs. in this size of Banbury.

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The entire idea of this method of mixing is to get a very high degree of dispersion. It is important to point out that the fillers are mixed for about 12 minutes without softeners of any type, at about 32% overload in mixer. This gives a "scrubbing" effect for non-black fillers at the earlier stages, and as the temperature rises the butyl polymer coats the surface of the fillers.

Polyac

This material, chemically p-dinitroso-benzene, is a very active material with Butyl polymer.

★ ★ ★

We have used only the newer type of Polyac dispersed in wax. This gives a much better dispersion in the mass of compound. It is added to the mixer at 295°F, a temperature at which rapid "prereaction" takes place, for 8 minutes. This insures the complete reaction of the p-dinitroso-benzene. If this precaution is not taken, Polyac can cause "scorch" as it is a very active accelerator for Butyl polymer.

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We are recommending the use of small amounts of Polyac for two reasons.

(1) It helps to build temperature in mixer for Butyl insulation compounds.

(2) Small amounts of this chemical in the stock, mixed as outlined, will cut down the flow and improve storage conditions of unvulcanized stocks.

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You might call this mixing system a variation of "dynamic heat treatment" as outlined by Esso Laboratories.

Accelerator Master Batches

The red lead, benzothiazl sulfide and the Quinones are masterbatched as follows:

Butyl R-35-100
Red Lead-200
Butyl R-35-100
Benzothiazl Disulfide 200
Butyl R-35-100
GMF or Di Benzo GMF 200

★ ★ ★

These master batches can be made on a mill or Banbury mixer. In our base stock we have included at the late stages of mix (5 minutes before discharge), the red lead and benzothiazl disulfide masters. We never add the quinone master batches in the base stock mix, due to high temperature. Some technologists have tried using 2 cycle Banbury mix—the first cycle being the Base Stock, the second cycle in a cool Banbury the quinone M.B. was added. Our best results were obtained by adding the quinone Master batch on a 60" mill and then cutting "hats", which can be fed into the CV tuber either warm or cold fed.

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We cannot emphasize too strongly the necessity of cleaning the internal mixer very thoroughly before mixing butyl insulations, especially if natural rubber, GR-S or Neoprene compounds are mixed in it.

★ ★ ★

The mills and the guides must be cleaned and "scum films" on mills must be removed or difficulty will be encountered.

Quinone Acceleration

Since our presentation of butyl polymer compounds are divided into two main classes, the acceleration is divided into two classes.

On 100 parts R-35 Polymer	Low Voltage	High Voltage
GMF	2	-
DiBenzo GMF	-	6
Benzothiazyl Disulfide	4	-
Red Lead	6	10

The GMF curing system is chosen for the low voltage class for the following reasons:

(1) It is faster curing than the Di-Benzo GMF series.

(2) It usually gives higher physical tests than the DiBenzo GMF. As a reminder of the previous statement made in this paper, tentative specifications such as Type RHW call for at least 700 lbs. minimum tensile strength.

(3) This system not only has a lower pound cost but the compound has a lower gravity and hence a lower volume cost.

★ ★ ★

For the High Voltage Cables the advantage of DiBenzo GMF acceleration is:

It is much safer for heavier walls of insulation. In a large tubing machine with self-centering dies, there is no bleeder valve for excess stock and this acceleration is, therefore, much safer to use.

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In the DiBenzo acceleration we have used 1.5% sulphur and cured insulation in open steam for 90 seconds at 200 lbs. steam. This was a large cable and the cure rate fairly slow. Results are herewith tabulated.

Cure System - DiBenzo GMF 6 Red Lead 10

Sulfur	Tens	Elong	20 Hours Air Bomb Tens	20 Hours Air Bomb Elong	% Retained Tens	% Retained Elong
1.5%	935	565%	930	480%	99	84
0.5%	955	570%	645	450%	67	78
0.22%	845	545%	590	420%	64	69

Physical Tests - Average of 3 Specimens

In the DiBenzo-GMF system, 1.5% of Sulfur does smooth out cure and does no harm on ageing. Later electrical data will also show that it is electrically stable.

★ ★ ★

In the GMF system, however, we have practically avoided sulfur. 0.15% to 0.20% was used on 100 parts Polymer, purely as a "promoting agent" with the small amount of FT Black at high temperature mixing. The reason for this is obvious from the table at top of next page.

★ ★ ★

While the sulfur here too promotes better cures, it is definitely not recommended because of high mechanical water absorption.

Cure System - 2 GMF, 4 Benzothiazyl Disulfide, 6 Red Lead

0.15%S			1.5%S		
Tensile	Elong	Water Absorption*	Tensile	Elong	Water Absorption*
789	650%	4.75	851	612%	11.9

*mg of H_2O/sq. in. 7 days at 70°C

Quinone Retardants

Now we come to the problem which has caused considerable difficulty in butyl insulation cures.

★ ★ ★

Several months ago we cured some 14 Solid-3/64" wall insulation on CV equipment with the results outlined on the next list of data. The mixing and acceleration was handled as previously outlined to take care of a high degree of dispersion. While Run #1 was tubed at about 125 ft./min., Run #2 cured very poorly at 35 ft./min. This difficulty was finally solved by consulting the Control Test Sheet on butyl polymer as furnished by Rubber Reserve Corp.

Curing System - GMF

	Tensile	Elong	Speed	
Run #1	745	610%	135 ft/min.	14 Solid-3/64" wall
Run #2	525	1075%	35 ft/min.	14 Solid-3/64" wall

(1) Stabilizer Content of Polymer - 0.17%
(2) Stabilizer Content of Polymer - 0.35%

Stabilizer Used - PBNA (Phenyl beta napthylamine)

We certainly do not wish to blame Rubber Reserve for this difficulty for the reason that no one, we believe, realized the retardation effect of PBNA in steam cures on the quinone type of cure. We hope, however, that now that we do know, this will be corrected everlastingly.

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It would be well to mention at this point that in the DiBenzo GMF system, a high PBNA content was equally damaging. On 10/64" walls of insulation the tensile averaged 400 lbs. to 500 lbs. sq. in.

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Under the subject of retardants we wish to call your attention to the DiBenzo GMF system with red lead, no sulfur, but co-accelerated with benzothiazyl disulfide. Wire cured with this system was sticky on the surface even though it showed excellent air bomb results.

Work is being carried on at this time, in running Mooney scorch tests at 180° and 200°F. The quinone-red lead system differs from the usual organic accelerator —sulfur system, in that there is no definite "critical temperature" above which vulcanization takes place at a very rapid rate. The amount of milling after the quinones are added increases Mooney viscosity and changes the scorch rate, in turn, at a slow but steady rate.

Cure System—6 DiBenzo, 3.6 Benzothiazyl DiSulfide, 10 Red Lead, No Sulfur

Cured on CV—245 lbs./sq. in. Steam

Original		20 hours Air Bomb	
Tensile	Elongation	Tensile	Elongation
880	625	920	620

In 75°C Water—Insulation Resistance Values—megolims/1000 ft.

Weeks	1 day	5	9	13	15	16	17	18	19
	33.8	68.1	119	145	145	135	137	120	Failure

The Mooney Viscosimeter

The Mooney machine has been of great assistance to the technical man and the processor in establishing uniformity, good control and knowledge of scorch in the normal rubber compounds. The most usual procedure is to run the viscosimeter at 250°F. With R-35 polymer, using the quinone-red lead system, we are not quite sure of what Mooney scorch means, at least with the 250°F results. We are in the position where we have to work with the quinone-red lead system and yet cannot use alkaline materials, least of all the antioxidant amines because of the severe retardation in open steam. Actually, most of the compounds shown here can be extruded with a head temperature of 175°-185°F.

★ ★ ★

We do want to bring out, however, the value of a high degree of dispersion of the accelerator system. If a base stock is mixed as outlined, but the GMF, benzothiazyl disulfide and red lead are added on the mill or second cycled in a Banbury as dry powder, which might be normal procedure for rubber compounds, the difference in Mooney Scorch results is very revealing.

GMF, Altax, Red Lead Master Batches	5 minutes*
Above, added as Dry Powders on Mill	1 minute*

* Mooney at 250°F, using small rotor Stock kept for 1½ minutes at 250°F, rotor started, minutes to 1 point rise.

Summary

We are now ready to show you the performance tests of the two main types of butyl insulations which have been mixed, processed and cured, all in continuous vulcanizing equipment as outlined in this paper.

(See table "Low Voltage Type" page 1051)

High Voltage Insulation

We would now like to show you Stability Factor data on two sizes of conductors with two different wall thicknesses.

STABILITY FACTOR
IPCEA Method EM60

Immersed in water at 50°C (122°F)
60 Cycles - 40 V/mil

	Dielectric Constant	% Power Factor
Wire - #6 strd - 4/64" wall		
1 day	3.69	1.3
52 weeks	3.83	2.6
Wire - 2/0 strd - 10/64" wall		
1 day	4.17	1.1
52 weeks	4.42	2.2

Cure System - 6 DiBenzo-GMF, 10 Red Lead

We cannot draw any conclusions on this subject at this time. We can, however, make some observations as follows:

(1) High temperature mixing aids not only in a very high degree of dispersion, but gives dense well cured stocks. High temperature mixes extrude smoothly.

(*Please turn to page* 1051)

Processing Tungsten Wire for Incandescent Lamps

by George R. Moritz and W. E. Anderson
Engineering Department, Lamp Division
Westinghouse Electric Corporation
Bloomfield, N. J.

In its uncoiled state tungsten wire for an ordinary incandescent lamp filament is so small as to be barely visible. The task of producing these filaments from tungsten ore is a complicated procedure. This article, descriptive of the process, was printed in the Westinghouse Engineer and is published here with the permission of the Westinghouse Electric Corporation. Since the preparation of this article Mr. Anderson has retired.

Although the lamp industry uses but a few hundred tons of tungsten a year, this tough metal is truly the heart of the industry. It is the only metal known that can fill the job as a lamp filament of the standard required.

★ ★ ★

Basically the metal has many properties that are ideal for the lamp applications. It has the highest melting point of any metal (about 3400 degrees C); it is the hardest metal known; and it has tensile strengths of 600,000 pounds per square inch at small diameters. However, obtaining the metal in its pure form and in suitable wire shape for filaments is by no means a simple task.

Production of Tungsten Wire

Filaments consist of minute and accurately wound wire. Often an initial coil is made and that in turn is wound into a second coil. Sometimes, it's even carried a step further and the second coil (coiled-coil) is wound into a third. Obviously, filament wire must be malleable and ductile. Yet, if the filament sags from its fabricated shape, efficiency is lessened. Hence it must be strong and non-sagging. In addition, the wire must have a high melting point, be vibration resistant, have a high resistivity, and a low vapor pressure.

★ ★ ★

Fortunately, tungsten has most of these properties. It has a high melting point; its resistivity is almost directly proportional to temperature; its tensile strength increases as the diameter decreases; it has a general resistance to the effects of high temperature; and it possesses a low vapor pressure at elevated temperatures. Other characteristics of tungsten have been engineered to meet the demands of filament wire for lamps.

★ ★ ★

The chemical processes involved in the production of tungsten for filament wire are largely concerned with obtaining pure tungsten powder. Filament wire with the desired crystal structure to resist sag and yet ductile is formed by powder metallurgy and treating methods.

★ ★ ★

Manufacture of wire consists roughly of the following successive operations: (1) purification to tungstic oxide (WO_3); (2) reduction of tungstic oxide to pure metal powder; (3) pressing of metal powder into ingots; (4) treating or sintering the ingots in a hydrogen atmosphere by means of electrical current; (5) swaging the square ingots to partially round bars; (6) drawing into wire; (7) annealing at various stages to relieve work strains; and (8) cleaning the wire in a hydrogen atmosphere with heat.

★ ★ ★

Purification of tungsten ore is unique in that it is not done in the usual manner of melting the ore and removing the impurities as a slag. Because of its high melting temperature it cannot practically be melted in crucibles. Carbon crucibles would withstand the temperature but would contaminate the tungsten. It therefore becomes necessary to use a

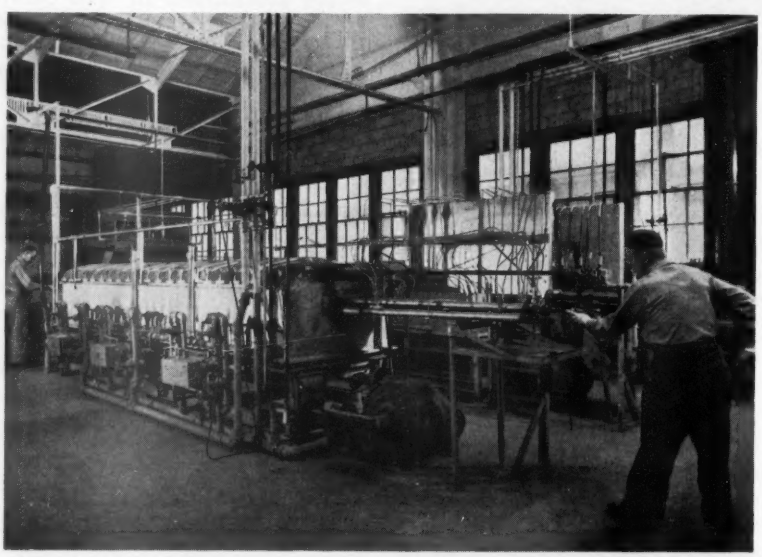

Figure 1—This gas-fired hydrogen furnace is used in the reduction of tungstic oxide to tungsten. The oxide is loaded in boats and pushed through the heated tubes. Hydrogen gas is passed through the tubes in the direction opposite to the flow of the boats. The photomicrograph above illustrates the resultant tungsten. * * * * * * * * * *

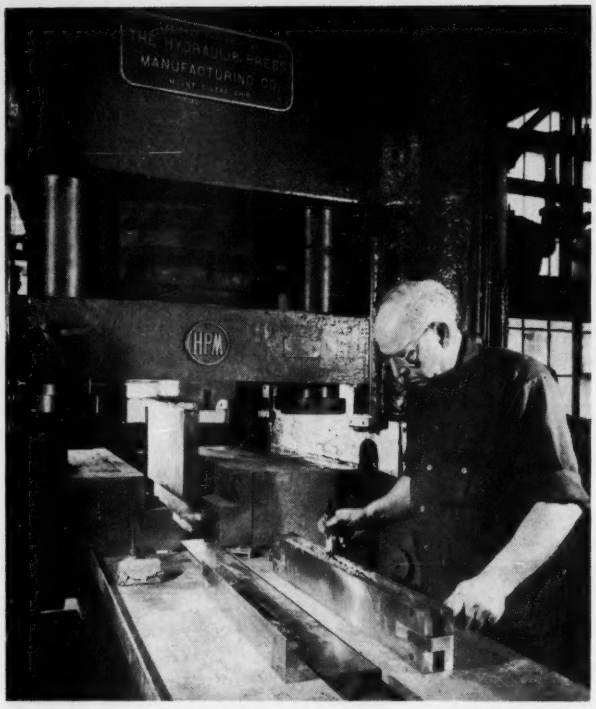

Figure 2—The tungsten powder is pressed into an ingot. This worker is levelling the powder in a mold prior to the pressing operation.

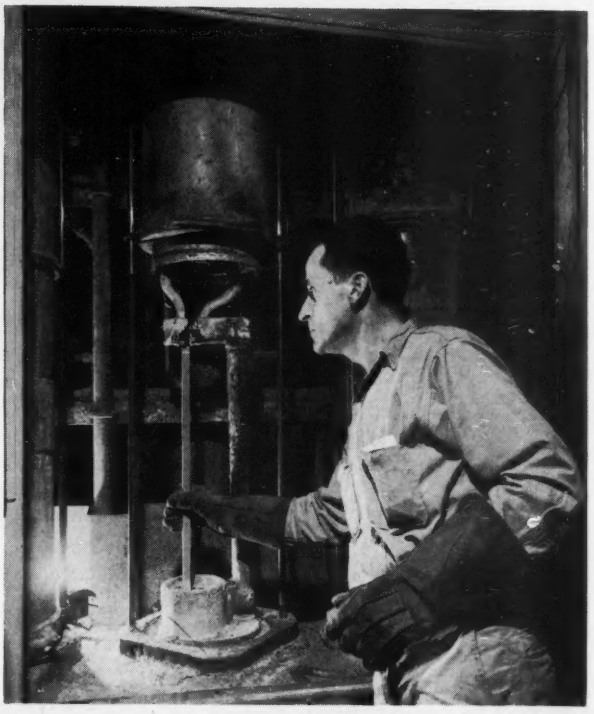

Figure 3—The pressed ingot in sintered by passing a high current through it. Here it is being inserted between the copper electrode at the top and a mercury pool. The mercury pool prevents breakage by allowing the ingot to move while it is shrinking. Inset photomicrograph shows the tungsten at the end of the process.

combination of chemical purification followed by furnace reduction to metal powder. This procedure must be quite meticulously carried out since small quantities of impurities such as tantalum, columbium, arsenic, or phosphorus have a decided effect on its properties and make working of the metal into wire an impossibility.

★ ★ ★

The tungsten ore, in the form of coarse brown particles, is first chemically analyzed to check the tungstic oxide content and to test for the many impurities that may be present. Having fulfilled the specification analysis requirements, the ore is ready for purification.

★ ★ ★

Digestion—The first stage in the manufacture of metallic tungsten is the separation of the WO_3 from the gangue materials. Extraction with caustic alkali is a major method and the one used by Westinghouse. The ore is pulverized so that all of it passes a 100-mesh screen. Calculated amounts of water, ore, and potassium hydroxide are added to a large steel tank or digestor supplied with an agitator and heated by gas. The process of getting the tungsten in solution by heating and agitating requires several hours. Water is added from time to time to prevent the resulting potassium-tungstate solution from crystallizing upon cooling. After complete dissolution has taken place, this solution is decanted. Most of the impurities settle to the bottom of the tank as a sludge while the top liquid contains the tungsten in solution as potassium tungstate. Small amounts of iron, molybdenum, calcium, aluminum, and silicon may also be in the solution.

★ ★ ★

Crystallization—The clear potassium-tungstate solution is then filtered and crystallized in another steel tank where it is heated and agitated. Crystals of potassium tungstate form at a specific concentration and settle to the bottom of the tank. Several such crystallizations are usually necessary before the desired pure white crystals of potassium tungstate are obtained. The crystals are separated from the liquid (mother liquor) by filtering, dissolving in water, and pumping into a rubber-lined tank for the next step—precipitation to tungstic acid (H_2WO_4).

★ ★ ★

Precipitation comes about when the hot potassium-tungstate solution is added to hot hydrochloric acid and water in the precipitating tank. A steam jet is used to heat the liquid to about 80 degrees C. Constant agitation assures a more complete precipitation of the tungstic acid.

★ ★ ★

The precipitated tungstic acid is very temperamental. It can be affected by temperature of solution, order of addition of acids, concentration, time of precipitation, and the rate at which the potassium tungstate is added to the acid. These variables are, of course, kept constant.

★ ★ ★

At the end of precipitation, nitric acid is added to prevent the solution from going colloidal. The canary-yellow precipitate of tung-

stic acid is decanted and given six water washes. After the washing, intentional additions of foreign material are made. These additives, or so-called "dopes," consist of small percentages of either potassium chloride (KCl) and potassium silicate (K_2SiO_3) to produce a non-sag tungsten filament, or quantities of a thorium nitrate [$Th(NO_3)_4$] to produce a vibration-resistant filament. The doped tungstic acid is subsequently dried in preparation for the reduction to metal powder. Such drying, of course, results in dehydration of the acid to tungstic oxide.

★ ★ ★

The oxide is reduced to the metal powder by passing hydrogen gas over it. This is done in a hydrogen furnace in a continuous flow. The oxide is loaded into iron, nickel, or molybdenum boats, which hold several hundred grams, and passed through long metal tubes. A counter-current flow of hydrogen is made to pass through these metal tubes which may be heated either electrically or by gas.

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A two-stage reduction is generally used to obtain a more uniform product. The furnace has three zones. At the first reduction, the temperatures range from 650-750 degrees C, producing a mixture of partially reduced metal powder and completely reduced powder. The second reduction takes place at a gradient of 750-850 degrees C. The fineness of the resultant metal powder is dependent on temperature of reduction, stoking time, hydrogen flow, and depth of oxide in each boat. The particle size of the tungsten powder for use as filament material may range from 0.1 to 8 or 10 microns.

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Pressing—Once the powder has been obtained, powder metallurgy methods are used to get a tungsten ingot. Interestingly, tungsten was one of the first metals to use powder metallurgy as an adjunct to its purification processes.

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The metal powder obtained from the final reduction process is thoroughly blended, sieved, and hydraulically pressed into an ingot with a rectangular cross section. This ingot is made by pressing the powder in a steel mold under 15-20 tons pressure. The resulting ingot is fragile and lacks any definite crystal structure. Preheating the ingot in a hydrogen furnace at a temperature of 1000-1100 degrees C for an hour supplies sufficient strength to permit subsequent handling.

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Treating or Sintering—The next step is, of course, to produce the desired crystal structure in the ingot. The first advance towards this structure is the sintering or treating operation, which consists of passing a high current through the pressed ingot while it is suspended in a hydrogen atmosphere. The ingot is suspended between a fixed contact and a mercury pool in a hydrogen-filled, water-cooled metal envelope. The current used to sinter a 600 gram ingot is 2500-3000 amperes while a current of 6000 amperes is necessary to treat a 2000 gram ingot. The ingot is thus treated to within ten percent of its fusion current and consequently becomes a crystalline metallic bar of virtually pure tungsten. At this high temperature, most of the remaining impurities are eliminated. A shrinkage of the ingot of about 10-15 percent takes place during this electrical heat-treating operation.

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Swaging—The ingot is strong but brittle at room temperatures and must be heated to about 1600 degrees C in an electric furnace in a hydrogen atmosphere before it can be worked (swaged). Swaging essentially consists of inserting the heated ingot between rapidly rotating hardened-steel hammers. These hammers, which deliver 10,000 blows per minute, round and elongate the ingot. Continued swaging to smaller diameters gives rise to the development of a large fibrous structure, which in turn imparts ductility and toughness to the rod. Each time the rods are swaged they are heated prior to swaging. The rods are subjected to decreasing sizes of swaging hammers until they are reduced to 0.090 inch in diameter.

Drawing—The drawing operations consist of lubricating the wire with colloidal graphite, applying heat, and pulling through composition and diamond dies. As the diameter of the wire is decreased, the drawing speed is increased and the temperatures are decreased. It is necessary to interject annealing steps during these swaging and drawing operations, thus relieving the terrific strains set up in working the tungsten rod to fine wire. These annealing steps along with the working operations change the fibrous structure to a crystallized grain structure.

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Tungsten wire can be drawn to a diameter of 0.000394 inch and must be held to within a diameter tolerance of plus or minus one percent or about four millionths of an inch. These small dimensions are not measured with a micrometer but are determined by weighing a 200 millimeter length of wire.

Tungsten—Its Application in Electric Lamps

About 1.5 percent of the tungsten consumed in this country yearly is used in electric lamps. The bulk of this is used as filament material in incandescent lamps, the remaining as supports for the filament, as seal wire for lead-in conductors in hard-glass lamps, and as heater elements for electrodes in gas- or vapor-discharge lamps. In these applications, the greatest use is in the form of round wire, ranging in diameter from about three-ten-thousandths of an inch to approximately fifty thousandths of an inch. A comparatively insignificant amount is used in the form of flat ribbon.

Drawn Tungsten Wire to Coiled Filament

In making a coiled filament from tungsten wire there are four main steps: (1) the coil-winding operation on a mandrel; (2) baking or coil setting; (3) cutting coils to length; and (4) dissolving the mandrel.

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The most common method of forming coils or helices is to wind continuously the tungsten wire on

either iron of molybdenum mandrel wire. Coils for the general-lighting-service lamp are usually wound continuously, while for other lamps the coils are wound in sections. Some filament coils are wound with as many as 2100 turns per inch, which means that the spacing between coils is slightly less than two ten-thousanth inch and none of the turns must touch or even vary perceptibly in spacing.

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The wound coils are then baked on the mandrel in a hydrogen-atmosphere electric furnace to relieve strains set up during the coiling and thus give a permanent set to the coil, so that on removal of the mandrel the coil will remain as wound. Continuously wound coils must be cut to the required lengths before dissolving the mandrel wire.

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The mandrel wire is removed from the coil by dissolving in acids that do not attack tungsten. The coils are thoroughly washed successively in water and alcohol and then dried.

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The coils, after a thorough inspection for lengths, uneven winding, and surface defects, are ready to be mounted in lamps. The tungsten coil is "flashed" during the lamp assembly operation, which is performed on a lamp machine. Flashing consists of a step increase of voltage on the filament over the operating voltage of the lamp. This treatment develops a crystal structure in the filament that is instrumental in preventing sagging.

Some Coiling Considerations

Practically all lamps require tungsten for one or another function. In incandescent lamps tungsten, in the form of either single-helix or double-helix (coiled-coil) coils, constitutes the light-emitting filament. In other types of lighting, such as fluorescent or mercury vapor, tungsten is an electron-emitting element for exciting light from gas or vapor. The single helix is made by winding the wire on a mandrel with a spacing between turns of from two to eight tenths of the diameter of the wire; and on a mandrel ranging in diameter from 1½ to 5 times the diameter of the filament wire. This primary coiled mandrel is then wound on a second mandrel; then the mandrels are removed either by mechanical or chemical means.

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The fundamental object in coiling filaments is to take advantage of the interchange of radiant energy between adjacent turns of the wire and to reduce the surface cooling (particularly as regards gas-filled lamps). This obtains the maximum efficiency in light production in terms of lumens per watt, for the length of time the lamp is expected to burn. The life in hours of a tungsten filament is approximately inversely proportional to the seventh power of the efficiency.

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The first tungsten-filament lamps were of the vacuum type with the straight (not coiled) wire draped over the supporting structure in squirrel-cage fashion. A vacuum was necessary to prevent rapid oxidation and consumption of the filament when it was raised to incandescent temperatures. On the other hand, at reduced pressure, the tungsten evaporated at an increasingly rapid rate as the temperature was raised, and condensed on the inner surface of the glass bulb. This not only caused the light output from the filament, when burned at a constant voltage, to diminish rapidly with time, but also increased the absorption of the light as the deposited film of condensed tungsten on the bulb became more dense. Although ways were devised to diminish the effect of light absorption, it was not until the principle of applying a counter pressure on the filament—thus repressing the evaporation at the source—was developed, that the so-called lumen maintenance was substantially improved. This was accomplished by filling the lamp with a gas, such as nitrogen (and later argon) that was inert to the hot tungsten. But the gas also had a cooling effect; it was found that coiling the filament greatly improved the initial efficiency of the lamp for a given life and the lumen output throughout its life remained more nearly constant.

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Fortunately, the necessity for coiling the filaments did not appear until after drawn tungsten wire, with its greatly improved ductility, was developed. This took care of the mechanics of forming the coil and getting it mounted within the lamp. After it started to burn, however, the turns gradually opened up and the coil sagged as the result of gravitational pull. If this could be prevented, even greater improvement could be had in efficiency as well as lumen maintenance. Research as to the cause of this tendency to sag disclosed that the thorium oxide, product of thorium nitrate added as an original ingredient to prevent "off-sets" in the filament, in turn tended to promote sag when the filament was coiled and raised to operating temperature. The thorium oxide retarded crystal growth after the tungsten recrystallized out of its drawn fibrous structure, and increased the vibrational strength when brought up to the operating temperature of the filament. A change in this "dope" (i.e.,using potassium chloride and potassium silicate instead of thorium nitrate) not only promoted crystal growth, but also influenced the shape in such a way that the crystals became interlocking and supported each other against dislocation by gravity when hot. Not only did this solve the sag problem but also improved the ductility of the cold wire to the point where it could be wound into coils without auxiliary heat applied to the point of winding on the mandrel.

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To give some idea of the effect on lamp efficiency of coiling the filament, as a result of interchange of radiant energy between turns in vacuum, Table I is of interest. This shows the effect, in terms of percent of the efficiency of an uncoiled filament, of various mandrel and pitch ratios for filaments operated at the same current.

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The same table shows the ap-

proximate effect produced in a gas-filled lamp by two commonly used gases; also the percentage effect of double coiling is indicated. All filaments are of the same diameter, operated at the same current.

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In studying these relationships it must be remembered that the wire diameter and input current are constant, and that any increase in interchange of radiant energy, or loss due to the cooling effect increases or decreases the temperature of the filament. Since the burning life of the filament is inversely proportional to the maximum temperature of any one spot along its length, the life of the lamps at these efficiencies varies accordingly. To absorb the increase in energy due to coiling and have the filament remain at the same temperature, a decrease in current density, or conversely, an increase in the filament wire diameter is necessary. Similarly, an increase in current density or decrease in filament-wire diameter is necessary to compensate for the cooling effect produced by a gas.

Filament Requirements

Coiled filaments must also be arranged in different forms within the lamp, depending on the service for which the lamp is designed. For example, in general-lighting lamps the primary requisite is that the filament, mounted on its supporting structure, can be inserted easily through the neck of the bulb; this, in turn, is dependent on the type of socket in which the lamp is to be used. On the other hand, coils in lamps to be used for beam projection, either in optical systems or reflectors, must be concentrated as much as possible. This introduces additional effects of interchange of radiant energy between different sections of the coil. All of these effects, as well as those due to the kind, volume, and pressure of the gas used in gas-filled lamps, determine the diameter of a filament for a given current and efficiency rating as well as the length corresponding to a predetermined voltage rating for the lamp.

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These factors are combined into

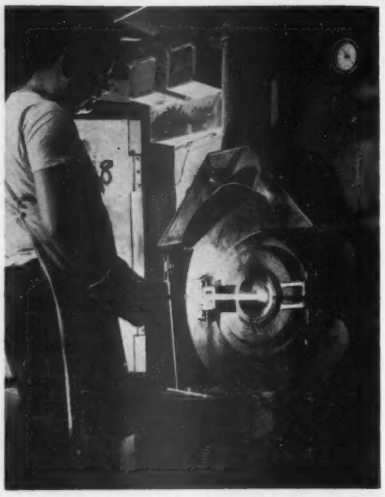

Figure 4—The first step in making wire from the treated ingot is hand swaging. Mechanical swaging follows.

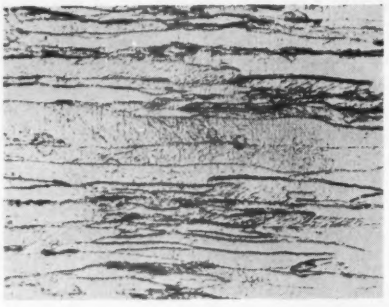

Figure 5—The photomicrograph above shows the tungsten structure after completion of this process.

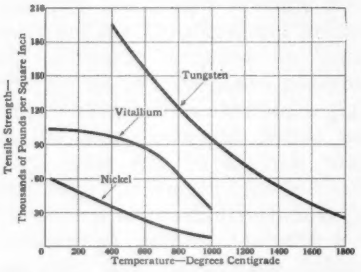

Figure 6—A comparison between the tensile strengths of tungsten, vitallium, and nickel at different temperatures.

two constants, M and C, in the formulas:

$$D = MA_{BE}^{\frac{2}{3}}$$

Diameter equals M times amperes at a basic efficiency (BE) raised to a two-thirds power.

$$L = CMV_{BE}A_{BE}^{\frac{1}{3}}$$

Length equals C times M times volts times amperes raised to the one-third power, both the volt and ampere values being at a basic efficiency.

To reduce the current and voltage to a basic efficiency—10 lumens per watt for vacuum lamps as representing general average for this class, 16 lumens per watt for gas-filled lamps—volt-ampere and volt-lumen characteristic curves have been accurately determined.

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Consequently, numerical values for the two constants (M, C) are a function of the overall design characteristics of each specific lamp—the mandrel and pitch ratios of the coil as determined by the shape and source dimensions required, the light source and bulb dimensions as determined by the service, the gas filling (or absence of gas) as determined by the wattage, voltage, light-source dimensions and efficiency, and the efficiency as determined by the service life expected. These values must be determined experimentally for each new lamp design except when the new lamp is closely related to a previous design or the lamp engineer has considerable experience in the interrelationships of these fundamentals.

TABLE I—EFFECT OF FILAMENT COILING ON LAMP EFFICIENCY

Filament	Gas	Percent Mandrel[1]	Percent Pitch[2]	Comparative Efficiency
Not coiled	Vacuum			100
Single helix	Vacuum	500	180	112
Single helix	Vacuum	500	150	127
Single helix	Vacuum	200	150	156
Single helix	Vacuum	200	120	195
Not coiled	Nitrogen			40
Single helix	Nitrogen	200	150	50
Single helix	Argon	200	150	70
Single helix	Argon	500	150	90
Coiled coil	Argon	200/200	150/150	135

[1]Percent mandrel is the ratio of the diameter of the mandrel to that of the filament times 100, i.e.,

$$\frac{d_m}{d_f} \times 100 = \text{percent mandrel}$$

[2]Percent pitch is the ratio of the pitch of the wound coil (distance between turns) to the diameter of the filament times 100, i.e.,

$$\frac{P}{d_f} \times 100 = \text{percent pitch}$$

TABLE II—PROPERTIES OF TUNGSTEN

Melting point	3410±20 deg C
Rate of vaporization at 2500 deg K	9.18×10^{-10} grams/cm²/sec
Rate of vaporization at 3000 deg K	9.92×10^{-7} grams/cm²/sec
Resistivity at 28 deg C	5.64 microhms/cm³
Resistivity at 2500 deg K	77.25 microhms/cm³
Resistivity at 3000 deg K	96.2 microhms/cm³
Normal brightness at 2500 deg K	237.5 candles/cm²
Normal brightness at 3000 deg K	1257 candles/cm²
Color temperature at 2500 deg K	2557 deg K
Color temperature at 3000 deg K	3094 deg K

As mentioned earlier, the kind of gas used in gas-filled lamps has considerable influence on the efficiency of the lamp. The lower the thermal conductivity and convection losses of the gas, the less the cooling effect on the filament. This should logically lead to the use of a gas with a minimum of these characteristics. Such gases

(*Please turn to page* 1062)

Wire Drawing — Costing and Cost Control

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An informed spotlight plays, in this article, on an operation (which may be a major or minor one in a metal working plant, depending on the products made) having characteristics simplifying material costing and permitting the use of machine hours as the costing base for all other elements. Heat treating and die costs are also involved. The article is reproduced through the courtesy of the National Association of Cost Accountants by whom it was furnished. It appeared in the July, 1953 issue of the N.A.C.A. Bulletin.

Wire drawing is a method of reducing ductile metals from a larger to a smaller diameter. This is accomplished by pulling the wire through a series of reducing dies. These are carboloy or diamond dies which contain a carbide compound or diamond stone with a contoured hole through the center. The die is housed in a circular steel disc about the size and appearance of the wheel on a child's roller skate. Dies are placed in the wire drawing machines in progressively smaller sizes so that the wire can be threaded and pulled through at the optimum speed required.

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Each time the wire passes through a die, its diameter becomes smaller and smaller until the desired size is obtained. Wire may be hot-drawn or cold-drawn. When hot-drawn, it passes through a furnace before passing through the die. If cold-drawn, the wire will go through a series of dies without the prerequisite of heating. However, after a certain degree of reduction has been attained, heat treating is necessary before further reduction takes place, in order to bring about an equi-axed grain structure and to restore ductility. Each time the wire passes through a successive die, the tensile and yield strengths increase while elongation decreases.

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Proper temper is imparted by scheduling heat treatment at strategic points so that the reduction which follows will be of sufficient degree to bring about the desired hardness or temper. These vary with the products for which the wire is to be used. Such products are quite numerous. A few are:

Fences
Springs
Cables
Nails
Wire used for screens and weaving
Resistor wire in toasters
Filaments in light bulbs
Base pins in radio tubes
Electrical conductive wire
Sponge wire used for cleaning

Costing Problems in Wire Drawing; Machine Hour Basis

Costing of the drawing of wire presents somewhat unique problems. The reason is that standards cannot readily be set on all the operations, particularly when a large variety of wire is drawn in relatively small lots. For one thing, heat treating (annealing) necessarily does not lend itself to time study. The amount of heat treating cost to be applied to each type of wire cannot be determined through the customary multiplication of production by the standard allowance. Die costs, likewise, present problems in allocation because the use of a die of a particular size is not confined to a specific size or type of wire. The allocation of die costs to types of wire is further complicated because of the tendency of different materials to have different rates of wear on the dies. Another peculiarity is that, in wire drawing, no material is added after the initial drawing.

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A further characteristic is that, contrary to the frequent practice of using direct labor as a base for applying overhead, wire drawing utilizes machine hours as a case. Briefly, the number of machine hours is multiplied by the machine hour rate which includes not only overhead but direct labor as well. However, this basis is not used blindly but with discretion and, as will be shown later, a separate machine hour rate is set for differing types of equipment. This follows the circumstance that the operator of a wire drawing machine acts more as a machine attendant than an operator. His work consists of loading the machine, threading the wire through the dies, and removing the finished spool. If a break occurs, he must rethread the wire. The time expended by an operator is such that he can easily attend two machines of a type in general use. The operator's effort does not vary with the pounds (or meters) of wire drawn but rather with the number of times he must load, unload, and rethread breaks in the wire.

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In short, it is the number of hours that the wire drawing machine operates which varies in direct proportion to the amount of wire drawn. Direct labor is more in the nature of a fixed cost. Machine maintenance, die costs, depreciation, and the other items of overhead are, therefore, apportioned more equitably on a machine hour base than on a direct labor base.

Heat Treating Costs

Two costs accompanying wire drawing and mentioned above, merit initial attention. For one, heat treating cost is difficult to

assign to specific sizes of wire because of the fact that a good deal of the annealing is done in a pot furnace, i.e., various sizes, some on spools, some in unspooled coils, are heaped into the annealing pot which is sometimes half full and sometimes one-quarter or three-quarters full. Some wire is strand annealed, i.e., in furnace tubes.

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Although standards can be set on strand annealing, the pot annealing operation defies all attempts at time study and scientific allocation. For this reason, pot annealing costs are best treated as general overhead in the wire drawing operation and are allocated to the machines on the basis of machine hours.

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The resulting costs will not be widely at variance with fact, because there is good correlation between the cost of heat treating and the number of machine hours of drawing time. The greater the degree of reduction, the greater the number of machine hours required to make the reduction. This also means that more frequent heat treating is needed, because ductility must be restored more frequently, for the harder the wire the smaller the degree of reduction which can be made in each pass. More machine hours and more frequent heat treating will be required to draw hard wire to a given diameter, than softer wire.

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It is recognized that the machine hour basis of allocating heat treating costs as part of overhead results in a small amount of distortion, in the cost of some types of wire which are sold as "soft," because this means that there is a heat treat operation without any further drawing or else there is a heat treat with only a small amount of subsequent drawing. However, to attempt to account for the cost of heat treating on each type of wire drawn would mean a prohibitive amount of clerical expense. Selling prices do not distinguish hard or soft.

Die Costs

We come now to die costs. The allocation of die costs to types of wire drawn presents a problem in a plant where numerous metals are used and where there is frequent interchange of types of wire on the various machines. Carboloy dies are generally used in drawing wire down to .020", while diamond dies are used for diameters under .020". As soon as a diamond die gets "out of round," it is ground down and used again for the next larger diameter. The procedure is repeated until the die is finally so large it can no longer be used.

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Die wear will be affected by the temper and type of wire as well as by the type of lubricant used. Generally, hard wires will wear dies faster. However, certain soft materials will wear them out as fast as the hard materials. Also, some types of wire like aluminum, nickel, chromium, and titanium, have oxides present which cause rapid wear. Using the correct lubricant for each type of wire will aid in reducing die wear. However, it is not practical to empty out the lubricant and refill with the right kind when the type of wire is changed frequently. For this reason, some all-purpose lubricant is ordinarily used.

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In a large wire drawing operation where the volume of each type of wire drawn is large enough to warrant the use of specific machines for wires having similar properties, it would be possible to determine die costs by types of wire drawn, with a high degree of accuracy. However, in a small operation there is no choice but to allocate die costs on the basis of number of machine hours required to draw each type of wire and then to apply correction factors based on an engineering estimate.

Two Products— And the Development of Rates

It might be well at this point to describe briefly the steps in drawing wire for two particular uses and to comment on the costing of the wire so drawn. We have selected for this purpose wire to be used for base pins in radio tubes and for sponge wire used in kitchen cleaning pads.

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The wire used for these two products is a special alloy consisting of nickel, chrome and iron. For purposes of this illustration, it will be assumed that the wire is purchased at a diameter of .150" and cold drawn down to .051", at which dimension it is ready to be cut into proper lengths for use as finished base pins. The cold drawing is done in two steps, down to .100" on the bull block and down to .051" on the 6-7 Pass Vaughn, with heat treating following each drawing.

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The same alloy is then used for drawing sponge wire. This is accomplished by drawing .051" wire down to .020" on the 6-7 Pass Vaughn and then putting the .020" wire through a fine wire drawing unit called the CF-1. This machine draws the wire down to .0055", at which point the wire is ready for sale.

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Overhead is assigned to the various machines on the most appropriate basis to determine sound machine hour rates for each type. Maintenance records indicate the amount of maintenance required for each machine. Depreciation is likewise known for each kind of machine. All rent-equivalent or occupancy expenses, such as heat, light, building depreciation, taxes, and building maintenance are allocated on the basis of floor space occupied. The expense of carboloy dies is allocated to the equipment used for drawing down to .020", while the cost of diamond dies plus the cost of die maintenance is charged to the remaining drawing machines on the basis of machine hours. Indirect labor is charged to each machine on the basis of percentages estimated by the departmental supervisors, in cases where a machine hour allocation would not be equitable.

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After all overhead is distributed to machines, the standard monthly machine hours at which it is anticipated that each machine will be operated, are divided into the

monthly overhead to obtain the overhead rate per machine hour. The resulting figures were as follows:

Bull Block	$2.50	per	machine	hour
6-7 Pass Vaughn	4.50	"	"	"
12 Pass Vaughn	5.15	"	"	"
CF-1	3.50	"	"	"

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Direct labor is determined for each machine on an hourly basis and then added to the hourly overhead rate to obtain a combined rate.

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Calculations for direct labor are illustrated by the following example:

MACHINE LABOR RATES

	Hrly. DL Cost Per Shift	No. Mach.	Hrly. DL Cost Per Machine	Allowances	DL Cost Per Mach. Hour
Bull Block	$1.32	1	$1.32	10%	$1.47
6-7 Pass Vaughn	1.37	1	1.37	10%	1.52
12 Pass Vaughn	1.37	3	.46	10%	.51
CF-1	1.37	3	.46	10%	.51

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The overhead rate is then added and also the rates for heat treating. In the interest of simplicity, strand annealing, like pot annealing, is assumed to be in the nature of a general overhead item. The total direct labor in both these operations is added to arrive at a total and then divided by the total machine hours for all wire drawing machines. Using the overhead and direct labor rates cited above and assuming $0.35 for heat treating, the combined machine rates became as follows:

MACHINE LABOR AND OVERHEAD RATES

	Labor	Overhead	Heat Treat.	Total
Bull Block	$1.47	$2.50	$.35	$4.32
6-7 Pass Vaughn	1.52	4.50	.35	6.37
12 Pass Vaughn	.51	5.15	.35	6.01
CF-1	.51	3.50	.35	4.36

Wire Drawing Standards

We have now developed the means through which labor and overhead costs (including heat-treating) are applied, i.e., as a rate per hour, depending on the type of machine used. Thus, if we know the machine types and times involved in particular kinds of wire, we are in a position to set product standards for labor and overhead from the machine rates. If we again take base pins for radio tubes and sponge wire as examples, we find the following pounds per hour (very fine wire is measured in meters) convertible into hours per cwt.

MACHINE PRODUCTION RATES

	Wire Drawn From	To	Lbs. Per Hour	Conversion to Hrs. Per Cwt.
Base pins for radio tubes				
Bull Block	.150"	.100"	400	.25
6-7 Pass Vaughn	.100"	.051"	200	.50
Additional drawing to get sponge wire				
6-7 Pass Vaughn	.051"	.020"	50	2.00
CF-1	.020"	.0055"	20	5.00

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Thus it takes only combined use of machine cost rates and the production rates appearing in the last column of the two tables above, to give labor and overhead product standards costs, as follows:

LABOR AND OVERHEAD STANDARD DRAWING COSTS

	Size From	To	Hours Per Cwt.	Machine Rate	Cost Per Cwt.	Cumulative Cost Per Cwt.
Base pins for radio tubes						
Bull Block	.150"	.100"	.25	$4.32	$ 1.08	$ 1.08
6-7 Pass Vaughn	.100"	.051"	.50	6.37	3.19	4.27
Additional drawing to get sponge wire						
6-7 Pass Vaughn	.051"	.020"	2.00	6.37	12.74	17.01
CF-1	.020"	.0055"	5.00	4.36	21.80	38.81

From the final column of this table it will be seen that the labor and overhead standard cost of wire drawn down to base pin thickness will be $4.27 per 100 lbs. and that the two additional drawings needed for sponge wire bring the labor and overhead standard cost for that product to $38.81 per 100 lbs.

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To these standards we need to add the cost of material. Since no material is added in the process of wire drawing, material costing is fairly easy, inasmuch as material in one pound of .150" wire is exactly the same as in .020", the only varying factor being the amount of shrinkage caused through snarling, breakage, and poor drawing because of worn dies or improper annealing.

(*See Exhibit I bottom page*)

Daily Production Report For Control

Because the presence of the operator of each group of machines is required, regardless of whether all or only one machine of his group is in operation, direct labor is a fixed cost in wire drawing operations. Therefore, the problem

Exhibit I: DAILY PRODUCTION REPORT

Machine	Material	Size From	To	Production	Hrs.	Actual Prod. Hr.	Std. Prod. Hr.
Bull Block	A Nickel	.125"	.100"	10,300 lbs.	26.5	388 lbs.	370 lbs.
Bull Block	A Nickel	.250"	.194"	13,900 lbs.	35.0	397 lbs.	385 lbs.
6-7 Pass Vaughn	S Nickel	.100"	.040"	1,500 lbs.	13.0	114 lbs.	115 lbs.
6-7 Pass Vaughn	#4 Alloy	.100"	.051"	2,700 lbs.	14.0	193 lbs.	200 lbs.
6-7 Pass Vaughn	*#4 Alloy	.030"	.020"	2,000 lbs.	21.5	93 lbs.	102 lbs.

* Nonstandard Draw.

of controlling direct labor variances is similar to the problem of keeping the fixed overhead costs under control. Our principal accounting means for this control is a production report issued daily, weekly, and monthly. This is illustrated in Exhibit 1 and compares actual with standard production hours. The information is also accumulated from month to month, so that the report can be compiled on a quarterly, semi-annual, or even annual basis, if need be. The comparison of the actual production per hour with the standard production per hour furnishes the wire department foreman with a quick analysis of each day's operation.

The Problem of the Non-Standard Draw

Our concern with the control problem may be illustrated by the following typical example. Let us assume that the foreman's schedule requires that he draw 2,000 lbs. of .051″ wire down to .020″. Since the time standard for this operation is two hours per hundred pounds, the foreman's total allowance would be 40 hours. Let us assume that because of pressure to get out production, .030″ wire (intended for another purpose) is drawn down to .020″. Obviously, it takes fewer machine hours to draw wire down from .030″ than from .051″. The budget will, therefore, show a favorable variance, even though this nonstandard operation is costlier. It is costlier because it requires almost the same setup time and the same amount of effort in loading and unloading, whether the draw is .051″ to .020″ or .030″ to 020″.

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The problem resolves itself into two parts. The first is an analysis of each day's production, in such fashion as to highlight any nonstandard draws. The daily production report does this. Second, in the event that a nonstandard draw is made, the budget allowance should be based only on the degree of reduction which actually takes place. This presents a difficulty, because standards are not set on reductions which are uneconomical.

The last line in Exhibit 1 displays such a nonstandard draw. The problem as to how the variance can be measured when .030″ wire, rather than .051″ is drawn down to .020″, resolves itself into a problem of interpolation. (This is how the necessary standard figure of 102 pounds per hour was provided for the applicable line on Exhibit 1.) Probably the graphic method is the simplest way to arrive at the answer. The 6-7 Pass Vaughn utilizes seven dies, each die bringing about a 15 per cent to 20 per cent reduction in the wire being drawn. Since the percentage reduction for each die in a given machine is the same, logarithmic graph paper should be used in preference to the conventional scale, because equal percentage changes will show as a straight line. (On the conventional graph scales, equal percentage changes would result in a curved line which would make interpolation less accurate.)

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Exhibit 2 shows the cost of .051″ wire plotted at $4.27 and .020″ wire plotted at $17.01. (These calculations are from an earlier table in this article.) By connecting these two points with a straight line and interpolating at .030″ we arrive at a cost of $10.75 for .030″ wire. Subtracting $10.75 from $17.01, we get $6.26 per 100 pounds as the allowable cost for drawing between .030″ and .020″. Since the rate for this machine is $6.37 per hour, we need only divide $6.26 by $6.37 to arrive at the allowable machine hours for drawing .030″ wire down to .020″. The result of the division is .98 machine hours per 100 pounds. The allowance for drawing 2,000 pounds, therefore, would be 19.6 hours.

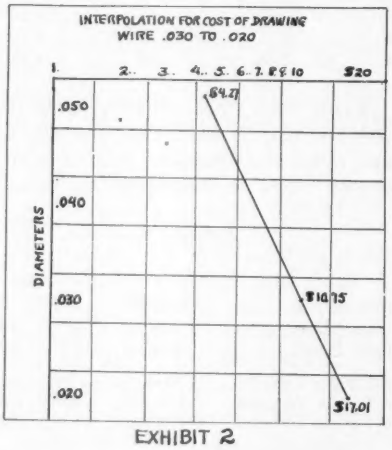

EXHIBIT 2

★ ★ ★

The standard production per hour would be obtained by dividing 19.6 hours into 2,000 pounds, the production quantity involved, thus arriving at 102 pounds per hour as the allowance. This is the figure shown in the last column of the production report, asterisked to indicate a nonstandard draw. Highlighting nonstandard draws discloses uneconomical practices.

Successful Cost Control

Wire drawing is an operation in which good control can be exercised through use of a single index, i.e., comparison of actual production per hour with standard production per hour. The reason that this single index will work effectively is that material, labor and overhead are closely tied together. Material is put into process only once. Labor and overhead are applied in a single rate.

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An inspection of the production report on a particular day in which shrinkage was high in drawing nickel from .125″ to .100″, for example, will show that the production per hour was less than the standard allowance per hour. It would follow that labor and overhead costs would also be in excess of standard. (Incidentally, if the .100″ wire referred to above were taken out of stock at a later time to be drawn further, the material cost would then be the accumulated material, labor and overhead cost at the end of the .125″ to .100″ draw.)

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It is true that exercise of control through comparison of actual production per unit of time with the standard allowance, is fundamental to cost control in industry as a whole. However, it is especially applicable to wire drawing because of the correlation among material, labor and overhead in the

(*Please turn to page* 1061)

Control of Wire Draft: An Experimental Pulling-Power Gauge

by Oskar Hermann

This article, which appeared in the October, 1953, issue of Draht, has been translated and briefed by Jerome W. Howe, Worcester, Mass.

Measurement of the power required to draw a wire through a die is considered a criterion for uniformity in drawing conditions. The article describes an experimental indicator gauge that signals to the drawer any change in drawing power, and consequently, in drawing conditions, thus tending to insure a more uniform quality of wire.

Inspection of the drawn wire consists, among other things, in the examination of the diameter at the beginning and at the end of the coil (as far as possible the variation of diameter inside the coil should be noted), test of roundness, the surface condition, and the physical data, such as tensile strength, elongation and electrical resistance. All these tests must be first undertaken on the finished drawn wire. The wire which does not meet the specifications must either be discarded or drawn to a smaller diameter. Hence the need for means whereby the drawer can know whether satisfactory conditions are persisting throughout the drawing. Control of the draft is necessary not only in the final draft but in all intermediate drafts, since faults introduced by them are likely to remain in the final product.

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With especially high quality drawn products the single draft machine is usually employed for the final draft, and perhaps for the intermediate drafts as well. The drawer then serves several machines, whereby the difficulty of control is increased. For the final draft especially, there would accordingly be a great advantage in an arrangement which would indicate the continuance of proper draft conditions.

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The arrangement described by Herr Hermann for indicating the variation in the drawing force is simple, and is shown schematically in Figure 1, and as actually made in Figure 2. The pull on the wire is opposed by the flat springs. The electric die heater (6) fits on a sleeve (11) which is held to the breast of the drawing bench (8) by the four flat spring carriage (13) set in the rigid holder (5). Two knurled-head screws (12) permit the die and heater to be clamped at any position along the axis of draft. A cross-bar (10) which likewise can be released by two screws, gives sufficient rigidity to the holder. The motion of the die holder (6, 11) is transmitted to the pointer (4) through a leverage. Electric contacts (3) are attached on the scale (2) either side of and equidistant from the zero, which is at the mid-point. Their interval from zero can be adjusted at will. The support of the scale together with the signal light (1) which is connected by the cable (7) with a 6-volt transformer, can be rotated toward the right and left. The mid-position of the die holder can be fixed at will by means of the screws (9).

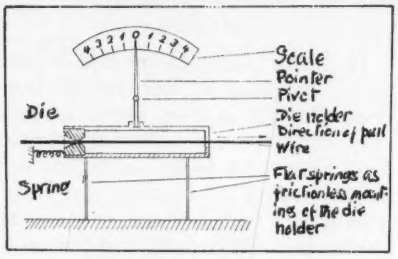

Fig. 1. Schematic sketch illustrating the operation of the pulling-power gauge.

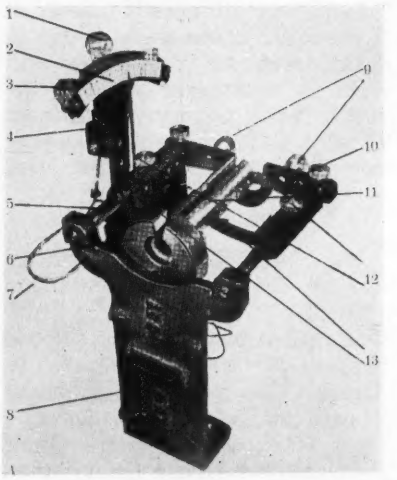

Fig. 2. The experimental pulling-power gauge.

1. Signal light
2. Scale
3. Electric contact
4. Pointer
5. Holding frame
6. Electric die heater
7. Electric cable
8. Drawing bench breast
9. Knurled-head screws
10. Cross-bar
11. Sleeve
12. Knurled-head screws
13. Flat springs

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After the wire is threaded into the die, the die-holder is, if necessary, brought to the desired mean position by manipulating the screws (9). Then the scale holder is rotated so that the vibrating pointer indicates zero. The electric contacts can be set to react to either slight or greater variations in the draft. Fine wire contacts are used so that no hard blows will buckle the pointer in the case of sudden large changes in draft.

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Experiences with different designs of apparatus have shown that the change in pulling power denotes a change in the draft conditions. The absolute value of the pulling power and its uniformity are a distinctive criterion for the quality of the drawn wire. In hot drawing, for example, the lubricant is many times burned up in the mouth of the die, which results in an uneven diameter of the drawn wire. The apparatus here described signals such a condition to the drawer.

★ ★ ★

The spring mounted die gives a

Wire Activities About The World

Translated by
Jerome W. Howe, C.E.
Worcester, Massachusetts

This report appeared in the February 25, 1955, issue of Draht-Welt and has been translated and briefed for us by Dr. Howe. It is published with the permission of Draht-Welt.

India and the Soviet Union appear to have reached an agreement respecting the building of a steel plant of about a million tons capacity. It seems fairly certain that India can and will make extensive purchases of equipment for their manufacturing industries, including wire products machines, to a value of about $600,000, according to the purchasing agent who is acting for the Indian government. It is planned to manufacture about 60,000 tons of wire products per year.

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More and more countries have undertaken the manufacture of screw nails with round and flat heads, as recently Spain, South Africa, Italy, Japan and Ireland have gone into the production of this item. There are two kinds, those in which the screw threads on the point of the nail constitute about 1/3 of the length of the nail, and those in which somewhat more than half the length is threaded. In overseas countries the first kind is preferred. The prices are relatively good and in rcent months run about $6.50 to $10.00 per ton over the price for common wire nails.

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The wire export business is somewhat quiet, which was to be expected, yet all predictions are that the business will hold rather steady, and this year's business may indeed equal that of 1954.

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Underbiddings in the wire market are at present detected only to a limited extent, from Yugoslavia, and somewhat from the Austrian industry. The offered amounts however are small.

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The wire business in Africa is holding up, and especially in the Congo, in British West Africa and in Kenya, sales will presumably (with exception of barbed-wire in which the so-called Mau-Mau purchases have already been delivered) run over those for 1954.

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In Latin America on the other hand, business is weaker. In the Near East it is even more noticeably weaker. On the other hand the Far East has added a series of larger orders of fencing and also conductor wire. Possibly larger stocks are being purchased because of the political situation.

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In Europe business is quieter in the south, but somewhat better in Scandinavia. In May, Spain will certainly renew her trade agreements with Germany; Portugal likewise, which will also make purchases of electric conductor wire and wire rod.

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Wire nails from several firms will be distributed in containers (250 to 500 lbs. weight) in order that various wares may be shipped back in the same containers. In America this method of shipment is particularly found in domestic trade. In export, the United Fruit Company well known for its broad interests in Central America, has undertaken the shipment of wire nails to Nicaragua, Honduras, Guatemala, El Salvador, Costa Rica and Panama, and brings back to North America bananas packed in the same containers. This mode of packaging lately has also been used for cocoa and peanuts from West African colonies.

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In Spain the need for high-potential conductor wire remains exceptionally severe, to replace old and unreliable cable and to connect up new plants for power. The demand exceeds the capacity of the national industry and the purchases from other countries which result from trade agreements are not sufficient. Now negotiations have been started to secure new shipments of U.S.A. cable and other conductor wire under ECA to a value of about $2.7 Million. Electric conductor material plays a big part in the trade agreement negotiations this Spring with Germany. In trade agreements with England from December, a quota of about $400,000 was arranged.

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The outlook for the future market for wire products machines is judged satisfactory. It is interesting that the American Machine Tool Association remarks in its report that in wire products machines a tendency toward fewer types and at the same time toward heavier units requiring more horsepower. In the wire industry there is no indication that the market is saturated. On the contrary, it is shown that the average age of existing machines in the industry has for the past three years steadily slightly increased. In 1955 one can reckon with certainty upon an increase in orders for wire products machines of 8 to 9% in the U.S.A. and 6 to 7% in Canada, over the figures for 1954.

★ ★ ★

The Minister of Economy of Argentina gives in detail the negotiations respecting trade agreements. According to this, deliveries of wire, as well as wire netting, from Germany to the Argentine in the amount of about two million dollars is provided.

THE ANNUAL CONVENTION OF THE WIRE ASSOCIATION

LA SALLE HOTEL, CHICAGO, ILLINOIS, NOVEMBER 14-17, 1955

The Wire Association's Headquarters at The La Salle Hotel
Will be open from Monday, November 14th, every evening during the convention.
Come and get acquainted.

THERE WILL BE A REGISTRATION FEE OF $11.00 FOR MEMBERS AND $13.00 FOR NON-MEMBERS, INCLUDING AN ANNUAL LUNCHEON TICKET, FOR ALL THOSE ATTENDING THE TECHNICAL SESSIONS AND MEETINGS. PLEASE HAVE YOUR ASSOCIATION MEMBERSHIP CARD WITH YOU AND SHOW IT WHEN REGISTERING.

ADMISSION WILL BE BY BADGE ONLY—PLEASE WEAR IT.

THE WIRE ASSOCIATION PROGRAM COMMITTEE FOR THE 1955 CONVENTION

GENERAL CHAIRMAN
John A. Moritz, President
Standard Industrial Compounds Co.
Chicago, Ill.

GENERAL ACTIVITIES

EXECUTIVE SECRETARY

Richard E. Brown
The Wire Association
Stamford, Conn.

REGISTRATION

R. S. Spengel, Asst. Exec. Secy.
The Wire Association
Stamford, Conn.

ENTERTAINMENT

Eber J. Hubbard, President
Hubbard Spool Company
Garrett, Ind.

All papers presented at the Convention by members of The Wire Association are eligible for consideration for the Annual Medal Award, and will be voted upon by the Board of Directors at the next Spring meeting of that body.

FERROUS DIVISION

CHAIRMAN

Stewart S. Gray, Asst. Vice Pres.
Union Wire Rope Corp.
Kansas City, Mo.

COMMITTEE MEMBERS

Theodore B. Dull
Superintendent, Wire Mill
Sheffield Steel Division
Armco Steel Corp.
Kansas City, Mo.

Edmund D. Sickels, Editor
Wire and Wire Products
Stamford, Conn.

Technical papers are preprinted in the October issue of Wire and Wire Products insofar as possible. Titles to papers accepted will be given to The Wire Association and duly copyrighted at the time of publication.

NON-FERROUS DIVISION

CHAIRMAN

Benoit J. Sirois, Met. Engineer
Phelps Dodge Copper Products Corp.
Elizabeth, N. J.

COMMITTEE MEMBERS

Andrew Pudlak, Field Engineer
Copperweld Steel Corporation
Glassport, Penna.

Willard deCamp Crater, Mgr. Vinyl Sales
Naugatuck Chemical Div.,
United States Rubber Co.
Naugatuck, Conn.

Charles M. Frederickson
Asst. Plant Superintendent
Kaiser Aluminum & Chemical Corp.,
Newark, Ohio

All wire mill men and wire mill suppliers are invited to attend this convention, see how the Association functions and participate in the activities.

Hotel reservations should be made by members of the Wire Association direct to the Secretary.
MAKE YOUR PLANS NOW TO ATTEND AND SEND YOUR RESERVATION PROMPTLY

MONDAY, NOVEMBER 14th

9:00 A.M.
REGISTRATION

10:00 A.M.
DIRECTORS' MEETING

12:30 P.M.
PROGRAM COMMITTEE LUNCHEON

THE CONVENTION PROGRAM (Tentative)

LA SALLE HOTEL, CHICAGO, ILLINOIS, NOVEMBER 14-17, 1955

MONDAY, NOVEMBER 14th

9:00 A.M. Registration Desk opens on the mezzanine floor.

10:00 A.M. Annual Meeting of the Board of Directors of the Wire Association.

12:30 P.M. Directors' Luncheon for Program Participants. Address of Welcome by Leslie C. Whitney, President, The Wire Association.

AFTERNOON SESSION—2:00 P. M.

FERROUS SECTION

Symposium on Production Scheduling Based on Inventory Control

CHAIRMAN OF MEETING

John A. Moritz, Pres., Standard Industrial Compound Co., Chicago, Ill.

PANEL MEMBERS

John L. Sanderson, Supt., Wire Mills
Keystone Steel & Wire Co., Peoria, Ill.

L. W. Hackley, Dir.—Production Planning
American Steel & Wire Div., U. S. Steel Corp.
Cleveland, Ohio.

Tom M. Girdler, Jr., Asst. Division Mgr.
Union Drawn Steel Div., Republic Steel Corp.
Massillon, Ohio

Representative:

C. M. Wilbur, Production Control Dept.
International Business Machines Corp., Endicott, N. Y.

A. C. Morse, Chicago Manager
Remington-Rand, Inc., Chicago, Ill.

AFTERNOON SESSION—1:30 P.M.

NON-FERROUS SECTION

CHAIRMAN OF MEETING

Charles M. Frederickson, Asst. Plant Supt., Kaiser Aluminum & Chemical Corp., Newark, Ohio

PAPER: "Progressive Work Hardening and Reannealing of Five Brands of High Conductivity Copper." — by M. V. Yokelson, Research Met. General Cable Corp., Bayonne, N. J. and M. Balicki, Prof., Met. Eng. Polytechnic Institute of Brooklyn

PAPER: "Effect of Cold Reduction on Some Properties of Nickel Wire" — by G. A. Nelson, Sylvania Electric Products, Inc., Warren, Pa.

PAPER: "Drawing and Processing of Titanium Wire" — by Douglas H. Wilson, Prod. Dept. Rem-Cru Titanium, Inc., Midland, Pa.

PAPER: "Ductility Tests for Electrical Conductors." — by Louis Boleraski, Research Engineer Kaiser Aluminum & Chemical Corp., Newark, O.

PAPER: "Wax Lubricants in Non-Ferrous Wire Drawing." — by John Werner, Field Eng., Indus. Prod. Dept. S .C. Johnson & Son, Inc., Racine, Wis.

TUESDAY, NOVEMBER 15th

MORNING SESSION—9:30 A.M.

FERROUS SECTION

CHAIRMAN OF MEETING

(To be announced)

PAPER: "Continuous Gauging of Wire for Out of Roundness." — by Charles D. Gibbs, Sales Mgr. Industrial Gauges Corp., Englewood, N. J.

PAPER: "Advantages of Phosphating in Fastener Forming." — by John Geyer, Mgr. Development Div. and Hugh Gehman, Asst. Manager American Chemical Paint Co., Ambler, Pa.

PAPER: "New Type Plating Barrel for Automatic Handling of Large Batches." — by N. Ransohoff, Chairman of Board N. Ransohoff, Inc., Hamilton, Ohio

MORNING SESSION—9:00 A.M.

NON-FERROUS SECTION

CHAIRMAN OF MEETING

Willard de C. Crater, Mgr., Vinyl Sales, Naugatuck, Chemical Div., U. S. Rubber Co., Naugatuck, Conn.

PAPER: "The Treatment of Copper Conductors in High Velocity Recirculating Type Gas-Fired Ovens." — by Charles A. Windsor, Mgr. Wire Equipment Div. Michigan Oven Co., Detroit, Mich.

PAPER: "Precision Solution Covering of Wire." — by Cyril A. Litzler, Pres. C. A. Litzler Co., Cleveland, Ohio

PAPER: "New Developments in Polyethylene Insulating Materials." — by R. J. Lurie and J. A. Snyder, Development Engineers Bakelite Co., New York, N. Y.

PAPER: "Accelerated Heat Aging of Polyethylene" — by W. W. Spohn and S. P. Foster E. I. du Pont de Nemours & Co., Wilmington, Del.

TUESDAY, NOVEMBER 15th (cont'd)

AFTERNOON SESSION—2:00 P.M.

FERROUS SECTION

CHAIRMAN OF MEETING
(To be announced)

PAPER: "Wire Descaling in Germany."	by Alfred O. Kogel, Mgr. Westfalische Drahtindustrie Westfalische, Germany
PAPER: "High Convection Annealing for Wire Coils."	by James L. Whitten, Vice. Pres. Lee Wilson Engineering Co. Cleveland, Ohio
PAPER: "Plastic Coating of Steel Wire."	by Joseph Beegle, Hauger—Beegle Associated Chicago, Ill.

AFTERNOON SESSION—1:30 P.M.

NON-FERROUS SECTION

CHAIRMAN OF MEETING
Willard de C. Crater, Mgr., Vinyl Sales, Naugatuck Chemical Div., U. S. Rubber Co., Naugatuck, Conn.

PAPER: "Mineral Insulated Metallic Sheathed Cables."	by G. S. Eager Jr., Asst. Dir. of Res. and S. P. Lamberton, Research Supervisor General Cable Corp., Bayonne, N. J.
PAPER: "The Trend Toward Vinyl Insulation in Automotive Wiring Systems"	by R. H. Publow, Chief Chemist Essex Wire Corp., Detroit, Mich.
PAPER: "Reel Drive Selection."	by R. K. Larson, Systems Eng. Section, General Electric Co. Schenectady, N. Y.
PAPER: "Maintenance and Repair of Signal Corps Wire Equipment."	by John A. Fitch, U.S.A. Signal Corps Philadelphia, Pa.
MOTION PICTURE: "In the Chips."	Shown through the courtesy of Chase Brass and Copper Co., Waterbury, Conn.

WEDNESDAY, NOVEMBER 16th

MORNING SESSION—9:30 A.M.

FERROUS SECTION

CHAIRMAN OF MEETING
(To be announced)

PAPER: "A Practical Psychological Approach to Quality Control."	by Glenn R. Lee, Supt., Wire Dept. Continental Steel Corp. Kokomo, Ind.
PAPER: "Factors Affecting the Characteristics of $Ca(OH)_2$ in Suspension, with Special Reference to the Wire Drawing Industry"	by Thomas C. Miller, Technical Director National Gypsum Co. Buffalo, N. Y.
PAPER: "Stress Corrosion and Relaxation of High Carbon Steel Wire for Prestressed Concrete."	by Clemens H. Eisenhuth, Eng. Felton & Guilleaume Carlswerk Koeln-Muelheim, Germany

MORNING SESSION—9:00 A.M.

NON-FERROUS SECTION

CHAIRMAN OF MEETING
Andrew Pudlak, Field Engineer, Copperweld Steel Co., Glassport, Pa.

PAPER: "Tin-Zinc Alloy Plating—Its Application to Copper Wire."	by F. A. Lowenheim, Supervisor, Electrochemical Research and R. T. Gore, Tech. Service Dept., Metal & Thermit, Rahway, N. J.
PAPER: "Basic Principles of Continuous Wire Plating.	by A. B. Ashton, Research Manager, Frederick Smith & Co., Ltd. Manchester, England
PAPER: "Wire Die Shape and Finish; Some Recent Developments in Production and Inspection."	by E. J. Schneider, Vice Pres. Engis Equipment Co. Chicago, Ill.
PAPER: "Chrome Carbides for Hot Extrusion of Brass and Copper"	by A. Earle Glen, Mgr.—Die Sales Carboloy Dept., General Electric Co. Detroit, Mich.
MOTION PICTURE: "Nerves of the Nation."	Shown through the courtesy of Anaconda Wire & Cable Co., New York, N. Y.

WEDNESDAY, NOVEMBER 16th (cont'd)

AT 1:00 P.M. — THE ANNUAL WIRE ASSOCIATION LUNCHEON

LADIES WELCOME LADIES WELCOME

THE PRESENTATION OF AWARDS FOR 1954

MEDAL AWARD: To Norman A. Wilson, Assistant Director of Research, Morgan Construction Co., Worcester, Mass., for his paper "The Cooling of Steel Wire During Continuous Wire Drawing."

CERTIFICATE OF HONORABLE MENTION: To Donald K. White, Foreman, No. 2 Wire Mill, John A. Roebling's Sons Corp., Trenton, N. J., for his paper "Continuous Patenting, Cleaning and Coating."

PRESENTATION OF TWENTY-FIVE YEAR CERTIFICATES by Leonard C. Crewe, Jr., Chairman, Board of Past Presidents.

THE MORDICA MEMORIAL LECTURE

"What Lies Ahead" by John H. Corson, Manager of the Laboratory, The Carpenter Steel Company, Reading, Pa.

AT 4:00 P.M.—THE ANNUAL MEETING OF THE WIRE ASSOCIATION

This is the annual business meeting of members of the Association. Your personal attendance is needed and urged.

Chairman of Meeting
Leslie C. Whitney, President
The Wire Association

IN THE EVENING BALLROOM FLOOR

THE ANNUAL STAG SMOKER—DINNER

6:30 P.M.—Cocktail Bar Opens

7:30 P.M.—Dinner and Show

CHAIRMAN, ENTERTAINMENT COMMITTEE: Eber J. Hubbard, Jr.

COME ONE, COME ALL—AND HAVE A GOOD TIME!

THURSDAY, NOVEMBER 17th

The day is devoted entirely to the plant inspection tour of the Waukegan, Ill., plant of the American Steel & Wire Div. of the United States Steel Corp. to see the manufacture of stainless steel wire.

The first bus leaves the LaSalle Hotel at 8 A.M. and the last bus leaves at 9 A.M.

All guests will be required to wear safety glasses and are asked to remain with the groups to which they are assigned. Glasses will be supplied at the plant.

Please go by bus. No one will be admitted to the plant after 10:30 A.M.

Luncheon may be obtained at several nearby restaurants after the tour. One bus will leave at 12 Noon and be back at the hotel by 1:30 P.M. Others will return to be back by 4 P. M.

BOTH FERROUS AND NON-FERROUS GROUPS ARE INVITED TO TAKE THIS TOUR

FOR THIS TOUR, ALL PERSONS MUST GO BY BUS. NO PRIVATE CARS MAY BE USED. TO BE ADMITTED, ALL VISITORS MUST WEAR THEIR BADGES; NO EXCEPTIONS, PLEASE. THESE MEASURES ARE FOR SECURITY AND SAFETY.

This plant inspection trip concludes the 1955 Convention.

RESEARCH PAPERS ARE PREPRINTED IN THE OCTOBER ISSUE OF WIRE AND WIRE PRODUCTS.

The Discussions and the Mordica Memorial Lecture will be printed in the January issue of Wire and Wire Products.

Papers not received in time for preprinting will be published in the November and December issues of Wire and Wire Products.

Government Wire Production Information

Reference Tables for Thermocouples

National Bureau of Standards' Circular 561, issued April 27, 1955, 84 pages, 22 tables, 50 cents, is now available.

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Superseding Circular 508, this volume gives expanded reference tables for platinum-platinum-10-percent rhodium, platinum-platinum-13-percent-rhodium, chromel-alumel, iron-constantan (modified 1913), copper-constantan, and chromel-constantan thermocouples with temperature in degrees Celsius (centigrade) and Fahrenheit and electromotive force in millivolts as the arguments. The tables are based upon the absolute electrical units and the International Temperature Scale of 1948.

★ ★ ★

Temperature-electromotive-force tables for thermocouples are used in science and industry to convert measured electromotive force of thermocouples into equivalent temperatures, testing and calibration of commercial thermocouples, the preparation of purchase specifications for thermocouple wire, and in precise calibration of instrument scales in order that temperatures may be read directly.

★ ★ ★

These tables may be ordered from the Government Printing Office, Washington 25, D.C. Foreign remittances must be in U. S. exchange and should include an additional one-third of the publication price to cover mailing costs.

BDSA Reports on First Quarter Copper Consumption

Unfilled orders for brass mill and copper wire mill products, already on the increase in the last quarter of 1954, continued to rise at an accelerated pace in the first quarter of this year, according to the Spring, 1955, copper industry report, issued recently by the Copper Division of the **Business and Defense Services Administration,** U. S. Department of Commerce.

★ ★ ★

Reports received by the Copper Division from companies representing 76% of the U. S. brass mill industry, indicated unfilled orders for the entire brass mill industry rose from an estimated 241 million pounds, metal weight, at the end of December to 360 million pounds at the end of March, 1955.

★ ★ ★

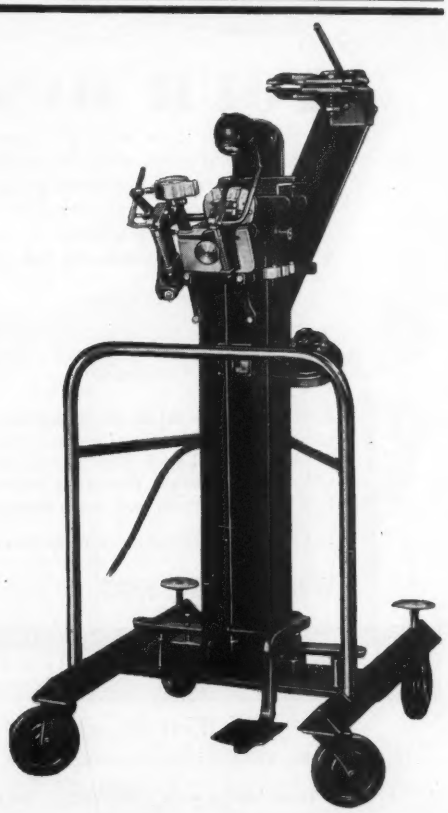
Reports from companies representing about 81% of the copper wire mill industry indicated an increase of from 167 million pounds, copper content, at the end of

MICROMETAL PRECISION — MICRO-WELD — TRADE MARK REGISTERED

MODELS J-3-S and J-4-S AUTOMATIC MICRO-WELD BUTT WELDERS

These welders are used for welding high and low carbon STEEL, and STEEL ALLOY wire, ranging in size from .020" to .160" diameter. All operations on these units, which include the clamping of the wire being welded, contacting the welding switch, and upsetting the weld, are made by a single downward stroke of the foot pedal. Welders for high carbon steel wire are equipped with the exclusive MICRO-WELD Dial indicating annealing device to facilitate the annealing operation of high carbon wire.

Standard equipment with these units include annealing dies, filing vise, light extension cord, and mounting on a 4-wheel truck. Special units can be furnished for crane mounting.



MICRO PRODUCTS CO.

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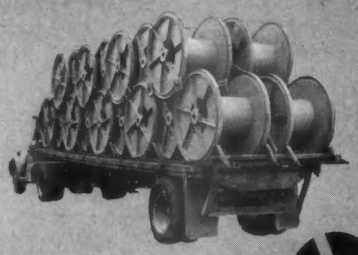
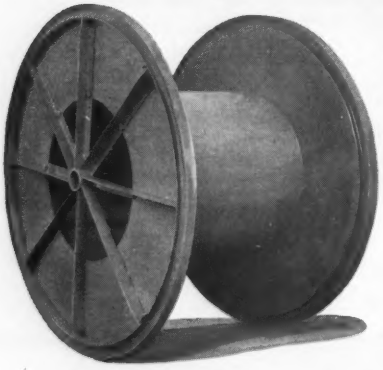
Telephone: STATE 2-7468

There's no premium on INGENUITY at NYECO

Here are 32 Steel Shipping Reels being delivered on 1 especially rigged truck. One more example of the versatility and flexibility that go into every NYECO job . . . that make for happy customer relationships.



NYECO Steel Shipping Reels



YOUR BEST BUY!

because they cost so little more, last *12 times* longer than wooden reels, require minimum maintenance. Rugged weatherproof, splinter-proof, warp-proof construction protects costly cable against damage due to dropping, bouncing, rough handling. It doesn't pay to risk an investment of thousands on inferior reels.

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SERVICE IS OUR BUSINESS: Qualified engineering staff will translate your problems into practical designs, from idea to finished product—or we'll work from your blueprints. 2 large modern plants with every automatic production facility, 100 in skilled personnel. Fast deliveries—motor, rail, water shipping at the premises.

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NEW YORK ENGINEERING COMPANY

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TELEPHONE: WHitehall 4-5380 **CABLE:** NYECO, N. Y. **PLANTS:** YONKERS, N. Y.

These leading mills prefer NYECO Steel Reels: OKONITE, ROEBLING, WESTERN ELECTRIC, GENERAL CABLE, ANACONDA, PHELPS DODGE

December to 227 million pounds at the end of the first quarter of 1955.

★ ★ ★

Brass mill and copper wire mill shipments likewise continued an upward trend, but at a somewhat less active pace than that reported for unfilled orders. First quarter, 1955, deliveries of brass mill products totaled 693 million pounds, metal weight, including imports, according to preliminary estimates as compared with deliveries of 567 million pounds in the fourth quarter of 1954.

★ ★ ★

Deliveries of wire mill products in the first three months of this year were estimated at 394 million pounds, copper content, an increase of 34 million pounds over deliveries in the preceding quarter.

★ ★ ★

The report states that a seasonal decline is anticipated in the third quarter of 1955 in both supply and demand for copper, due to vacation shutdowns in many plants in the copper producing and consuming industries. It is believed that the market for refined copper, however, probably will still be tight because some mills will continue purchasing the material to rebuild critically low working inventories which were pulled down during the first six months of the year, when the mills were trying to increase their production to the maximum.

Government Organization Manual

Publication of the 1955-56 edition of the "United States Government Organization Manual", a Government best seller, has been announced by the **General Services Administration.**

★ ★ ★

The revised Manual reflects the organization of the Federal Government as of June 1, 1955, and includes the names and titles of about 4,000 key officials.

★ ★ ★

A section outlining brief histories of all Federal agencies whose functions have been abolished or transferred since March

4, 1933, appears as Appendix A.

★ ★ ★

As the official organization handbook of the Federal Government, the 768-page Manual contains sections on the legislative, judicial, and executive branches. The descriptive material outlines the legislative authority, purpose, functions, and activities of each agency, and includes 40 charts showing the organization of Congress, the executive departments, and the large independent agencies as of June 1.

★ ★ ★

The Manual is one of the 5 best sellers published by the Government. Compiled by the Federal Register Division of the National Archives and Records Service, General Services Administration, the Manual may be purchased for $1.00 a copy from the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

Reynolds Metals Settles With G. S. A.

General Services Administration was on the receiving end of the largest cash transaction in its six-year career as the manager of Government property and records late in July, 1955.

★ ★ ★

The transaction brought $69,292,595.52 to the Treasury when GSA received the sum in cash from the **Reynolds Metals Company.**

★ ★ ★

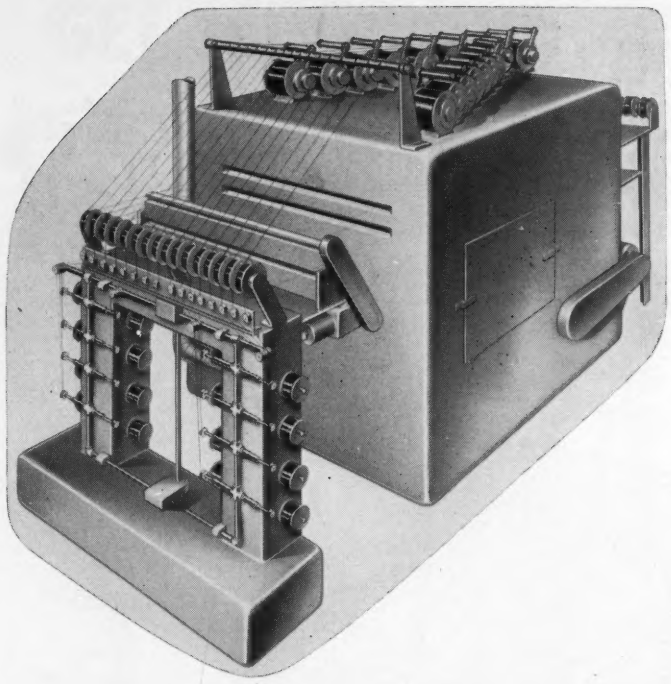
Two GSA representatives accepted payment in behalf of **Edmund F. Mansure,** Administrator of General Services. They were **Max Medley, Comptroller,** and **Maxwell H. Elliott,** General Counsel.

★ ★ ★

The sum paid in full and ahead of schedule was the mortgage debt GSA has held on eight Reynolds Metals aluminum-producing and aluminum-fabricating plants. They were once World War II surplus.

★ ★ ★

"Today's prepayment," Mr. Medley said, "is another step in GSA's



Increased Enameling Speed with Minimum Wire Breakage

By incorporating advanced design techniques with years of wire enameling research, this new MOCO fine wire enameling oven offers advanced enameling speeds with a marked decrease in breakage. The result is a cost-cutting operation with increased production.

The equipment is competitively priced and combines versatility with simplicity. The high degree of skill formerly required in performing this operation has been reduced—control of the product is handled by the machine.

OTHER NEW FEATURES INCLUDE:

- Advanced design, offering low fuel consumption—less maintenance.
- A wide range of insulating materials may be handled.
- New rapid start-and-stop device increases production.

FOR MORE DETAILS . . .

Write or phone for this informative brochure which tells the *complete* story of this new MOCO fine wire enameling equipment.

* * *

An experienced MOCO representative is near you—ready to aid in the solution of your wire enameling problems.

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PRODUCERS OF COMPLETE ENAMELING SYSTEMS FOR ALL WIRE SIZES

MICHIGAN OVEN COMPANY

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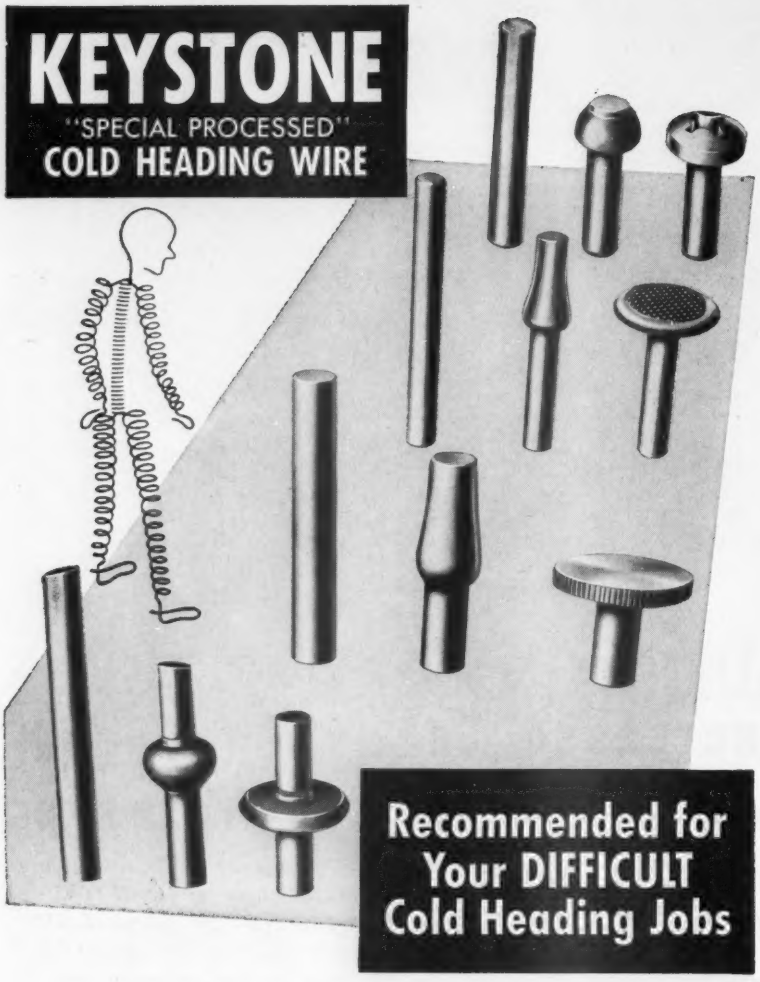


When you have "tough-to-make" cold heading jobs on your production schedule, it will pay you to consider the outstanding advantages offered by Keystone "Special Processed" Wire.

The superior grain flow characteristics of this wire provides the necessary upsetting and die forming qualities to withstand the terrific displacement of metal during the most difficult cold heading process. The structural soundness and uniformity of "Special Processed" Wire further proves itself through trouble-free machine operation, longer die life, and finished products of the highest quality.

If you have a special wire problem . . . large or small . . . let us help you solve it. Contact your Keystone representative or write.

program to obtain early payment of the mortgages it holds. The program was originated by Mr. Mansure early in 1954."

★ ★ ★

Reynolds Metals bought the plants in 1946 and 1949 for $66,051,584 from the **War Assets Administration** and later obtained an advance of $12,000,000 from GSA to expand its Longview, Washington, plant. This payment covered the outstanding principal with interest at 4 percent to the close of business yesterday. GSA turned over to the company the cancelled mortgage paper and notes.

★ ★ ★

In a companion transaction, Reynolds Metals also paid the outstanding balance on the largest loan ever guaranteed by GSA and thus relieved GSA of its liability. The loan, in its original amount of $76,750,000, was advanced in 1952 by ten banks and nine insurance companies. The funds were used to finance expansion of the company's alumina and aluminum production facilities.

★ ★ ★

The war surplus plants on which the indebtedness to the Treasury has been satisfied are located at: Listerhill, Ala., Phoenix, Ariz., Hurricane Creek and Jones Mills, Ark., McCook, Ill., Louisville, Ky., Grand Rapids, Mich., and Troutdale, Ore.

ABSTRACTS

THE PRODUCTION OF EXTREMELY THIN METAL WIRES. DIE HERSTELLUNG EXTREM DUENNER METALLDRAEHTE

H. Bittel. *VDI Zeits* 1955 Vol 97 (15/16) pp 486-488 (May 15) (In German)

Methods for electrolytic polishing of metal surfaces are useful for uniform removal of metal layers and therefore also applicable for producing extremely thin wires from metals of high tensile strength. By electrolytic wear in fluid, lamellar conditions can be created so that even soft wires can be subjected to this method. Wires of soft copper with dia of 2 micron and below can already be produced. Expected that in this way even thinner wires can be produced. 7 illustr, 7 ref.

TUBING: SMALLEST TUBING MADE IS BARELY VISIBLE TO EYE

Superior Tube Co. *Iron Age* 1955 Vol 175 (15) p 129 (Apr 14)

Outer dia of tube only 0.0014 in.; in-

ner dia approx 1/3 thickness of human hair. Tube cold drawn from 2 in. dia seamless nickel; 43 drawing operations (with intermediate annealing). Diamond dies used from 0.115 in. down. No commercial use yet known. 1 illustr.

INFLUENCE OF SURFACE-ACTIVE SUBSTANCES ON THE PLASTIC FLOW OF POLYCRYSTALLINE METALS (COPPER AND ALUMINIUM)
T. A. Amfiteatrova, B. Ya. Yampol'sky. *Doklady Akad Nauk* 1952 Vol 84 (2) pp 305-308; *Inst Met Journ: Metall Abstr* 1955 Vol 22 (8) col 724 (Apr) (Original in Russian)

Experiments on copper and aluminium wires.

ON CONVECTION BY FINE WIRES AND THE NATURE OF THE METAL/GAS INTERFACE
I. Epelboin, A. Vapaille. *Compt Rend* 1954 Vol 239 (21) pp 1363-1365; *Inst Met Journ: Metall Abstr* 1955 Vol 22 (8) col 744 (Apr) (Original in French)

DRIVING AND CONTROLLING WIRE DRAWING MACHINES
J. R. Erbe, H. A. Dickerson, *Blast Furn Steel Plant* 1954 Vol 42 pp 1048-1052 (Sep); pp 1169-1177 (Oct); abstr *Iron & Steel Inst Journ* 1955 Vol 180 (1) p 84 (May)

MACHINES FOR PRODUCING WIRE GAUZE AND WIRE MESH.
Maschinen zum Herstellen von Drahtgeweben und Drahtgittern
A. Jasper, *VDI Zeits* 1955 Vol 97 (15/16) pp 489-492 (May 15) (In German)

Description of main mechanisms and devices for producing wire gauze. 15 illustr, 3 tables.

CARBIDES FOR WIRE-DRAWING
J. Knaepper. *Tecn Ind* 1954 Vol 32 pp 572-573 (June); abstr *Iron & Steel Inst Journ* 1955 Vol 179 (4) p 382 (Apr) (Original in Spanish)

Brief exposition of theory and formulae relating to wire-drawing, with list of Spanish technical terms.

NOMOGRAMS FOR DETERMINING THE PERFORMANCE ON MULTIPLE DRAWING MACHINES.
Graphisches Rechnen zur Ermittlung der Leistung an Mehrfachziehmaschinen F. Kowalski. *Draht* 1955 Vol 6 (6) pp 215-217 (June) (In German)

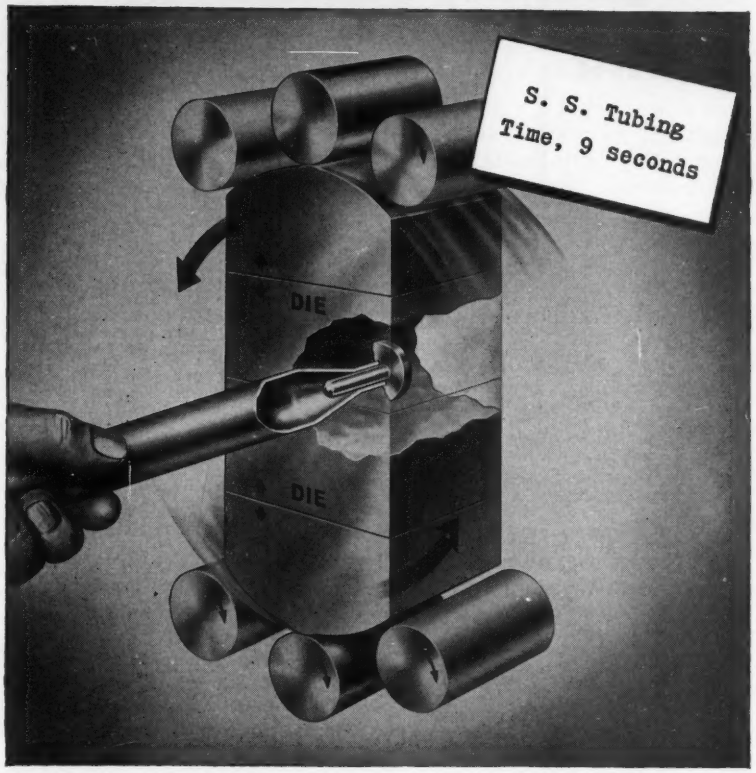
Number of new nomograms and slide rule suggested. 6 illustr.

CHANGE OF TUBE WALL THICKNESS AT DRAWING
B. Pocta. *Hutnicke Listy* 1955 Vol 10 (4) pp 194-200 (Apr) (In Czech; summary in English)

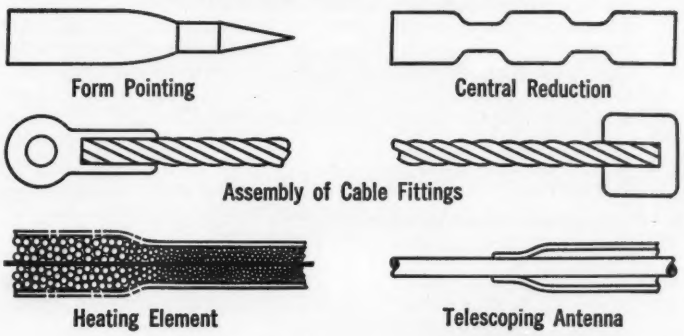
Experimental results show that change of wall thickness depends primarily on ratio between wall thickness and tube dia before drawing. Change does not depend directly on deformation degree, but on forming efficiency comprising this. 11 illustr.

WIRE-DRAWING MACHINES FOR STEEL WIRE
H. Richards (Marshall Richards Ma-

GET MORE PARTS
Instead of chips and scrap
with ROTARY SWAGING



OTHER SWAGING EXAMPLES:



Check with Fenn for engineering advice on swaging your product.

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PRECISION ROLLING MILLS—TURKS HEADS—WIRE SHAPING MILLS—SWAGING MACHINES—ACCESSORIES

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New WARDWELLIAN®

Pay-Off Stand

An improved Pay-Off Stand for delivering small diameter soft drawn wires from supply spools in the process of winding single or multiple ends on metal spools as supplies for WARDWELL RAPID BRAIDERS and other uses.

Maximum diameter wire approximately .012.

Due to the system used the wire strands can be payed off rapidly to deliver properly to the winding machine.

Supply spools are mounted in substantially vertical position to allow the strands to pay off over the spool heads.

Each strand of wire feeds around an individual tensioning roll adjustable for securing any desired tension.

This method of applying tension to each individual strand results in uniform tension on all strands.

A cylindrical guard surrounding each spool prevents interference between the strands during ballooning as they unwind from the spools. Guards can be raised and lowered for easy mounting and removal of supply spools.

Guides for wires are made of long-wearing Heanium material.

An auxiliary guide-stand for feeding strands to winder furnished with each Pay-Off Stand.

Stand will accommodate eight spools or can be extended for twelve supplies at slight additional cost.

Maximum diameter of supply spool head 8".

A standard set of eight spool-caps furnished with each stand.

Spool dimensions including diameter of bore must be furnished when ordering.

Weight of standard type for eight supply spools approximately 270 lbs.

Complete information on request

Ask about our other machines for braiding, shielding with wire, tape serving, yarn serving, asbestos serving, paper serving, armor serving and resistance wire serving.

WARDWELL
BRAIDING MACHINE CO.
Central Falls
Rhode Island, U. S. A.

Representatives for Europe, British Colonies and Dependencies
JAMES MACKIE & SONS, LTD., BELFAST, IRELAND

chine Co Ltd.) *Iron & Steel Inst Journ* 1955 Vol 180 (1) pp 60-65 (May)

Survey of types of machine in use in Gt Britain; British practice compared with European and U. S. Possible future developments in increased speed and efficiency.

DRAWING DIES — NEW MACHINE GIVES MIRROR FINISH FASTER THAN EVER BEFORE

Rockwell Machine Tool Co Ltd. *Metalworking Prodn* 1955 Vol 99 (21) p 31 (May 27)) (Advert)

Claimed that old methods of die polishing left small irregularities on surface at right angles to drawing direction; Beer abrasive-band machine designed to grind and polish in drawing direction, giving superior surface in much shorter time. Suitable for grinding before hardening and for grinding, lapping and polishing hardened steel and tungsten carbide dies. 2 illustr.

OPTICAL DRAWING CONE MEASURING DEVICE. Optischer Ziehkonus-Winkelmesser

Sachs. *Draht* 1955 Vol 6 (5) pp 190-191 (May) (In German)

Description of microscope which allows measurement of drawing angle when piece of wire pulled out. Angular graticule superimposed on rectangular grid in divisions of 1 mm (instrument by Robert Plagwitz, Berlin, but not mentioned in article). 5 illustr.

ENGLISH DRAWING DIE TESTING INSTRUMENT. Englische Ziehstein-Pruefgeraete

K. H. Treptow. *Stahl & Eisen* 1955 Vol 75 (12) pp 788-789 (June 16) (In German)

Detailed description of BISRA profilometer. 5 illustr.

GRAPHICAL REPRESENTATION OF THE DRAWING PROCESS WHEN DRAWING WIRE ON MULTIPLE DRAWING MACHINES. Zeichnerische Darstellung des Ziehvorganges beim Drahtziehen auf Mehrfachziemaschinen

K. H. Treptow. *Stahl & Eisen* 1955 Vol 75 (12) pp 784-785 (June 16) (In German)

New diagrams for control of wire drawing processes. 2 illustr.

COLD WORKING OF METALS

J. G. Wistreich. *Iron & Steel Inst Journ* 1955 Vol 180 (1) pp 51-59 (May)

Paper to Liverpool Metall Soc, Apr 8, 1954. Concepts of general significance in mechanical working of metals, illustr from various processes, including wire drawing. 18 illustr, 23 ref.

SINTERED CARBIDE DIES. Hartmetall Ziehsteine

Anon. *Draht-Welt* 1955 Vol 41 (9) pp 121-124 (May 10) (In German)

Historical development; standard sintering or sintering under heat and pressure. 3 illustr, 2 tables.

These abstracts are published through the courtesy and with the permission of the Industrial Diamond Research Bureau, 34 Holborn Viaduct, London, E.C.1, England. Inquiries regarding them should be directed to the Bureau.

Outstanding Personalities of the Wire Industry

30 Years in Magnet-Wire Industry

For Arthur Slepian of Bridgeport, Connecticut, 1955 marks the 30th Anniversary in the Magnet-Wire Industry.

★ ★ ★

His companies manufacture magnet-wire under the trade names of Ascomex, Asconamel, Insulation XX, Ascobond, Asconylon, Asconel and Asco Textile-Covered Wire. These products are used in many and varied applications.

★ ★ ★

By way of celebrating his 30 years in the trade, Mr. Slepian has issued a 30th Anniversary Folder that describes his products and announces the expansion of his three companies. Two plants are in Bridgeport: Arthur Slepian & Company and The Asco Wire & Cable Company, and the third, the Universal Wire & Cable Company, Ltd., is in Montreal, Canada. Plants are being considerably enlarged to meet the increasing demand for Asco Magnet Wire.

Die Company Elects President

Earle W. Hartley Jr., fifth generation member of a family identified with industrial activities, has been elected president and general manager of **Hartley Tool & Die Company,** founded 105 years ago, and having its plant and offices in Thomaston, Conn.

★ ★ ★

Mr. Hartley succeeds his father, **Earle W. Hartley Sr.,** who has become chairman of the board. His mother, **Mrs. Gladys B. Hartley** has been elected treasurer; **Alfred F. Meyerhands,** secretary; and **Stuart Meyerhands,** assistant secretary.

★ ★ ★

The firm was established in Philadelphia in 1850 by **Joseph Hartley,** an English immigrant. It is believed to be the oldest concern of its kind in the United States in the manufacture of diamond dies and more recently tungsten carbide. Most of the factory's life was spent in Waterbury until its expansion 15 years ago and its relocation here.

★ ★ ★

Mr. Hartley was born in Waterbury and educated in the public schools of that city, Taft School, Class of 1940, and attended Colgate University.

★ ★ ★

Jelliff Names Wheeler for Woven Wire Mesh Division

Halsted W. Wheeler is the new Sales Manager for the Woven Wire Mesh Division of **The C. O. Jelliff Manufacturing Corp.,** Southport, Conn., manufacturers of wire and wire products.

★ ★ ★

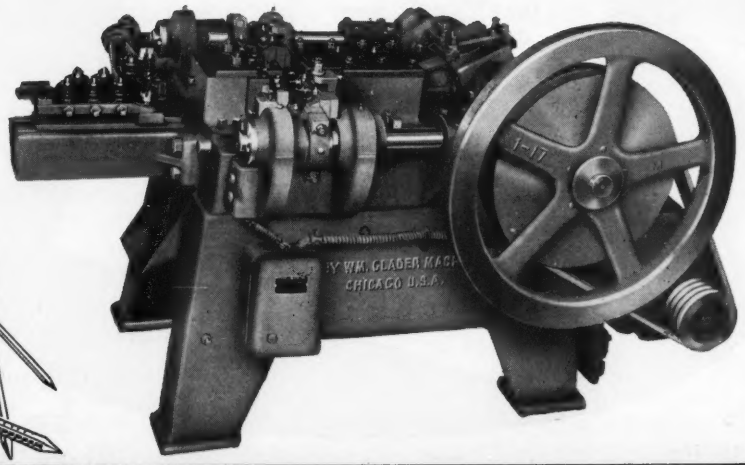
Mr. Wheeler brings to C. O.

Glader—Years of Proven Performance

GLADER NAIL MACHINES

55 YEARS of experience meeting the exacting demands of nail making.

The machine with a record of steady dependable service.



Wm. GLADER MACHINE WORKS 210 N. RACINE AVENUE CHICAGO 7, ILLINOIS

Export Dept.: 122 East 42nd Street, New York 17, N. Y.

Jelliff his experience in the Sales Departments of the American Chain & Cable Company, where he was connected with the Chain Division of that company's New England Sales District. Later, Mr. Wheeler transferred to the Detroit area where he worked with the American Chain-Rope Division. It is from there that he joins the Jelliff staff.

★ ★ ★

He is a graduate of St. Paul's Preparatory School of Concord, New Hampshire, and of Yale University.

Nine Companies Join NEMA

Nine electrical manufacturers have joined the **National Electrical Manufacturers Association,** it has been announced by **A. F. Metz,** president.

★ ★ ★

Their election brings to a total of 571 the Association's register of member companies.

★ ★ ★

The new members are: **Bar Bay Products, Inc.,** Brooklyn, N. Y.; **Cavalier Corp.,** Chattanooga, Tenn.; **Eureka X-Ray Tube Corp.,** Chicago, Ill.; **A. W. Fruh & Company,** Chicago, Ill.; **Marion Electrical Instrument Co.,** Manchester, N. H.; **Profexray, Inc.,** Maywood, Ill.; **St. Marys Carbon Co.,** St. Marys, Pa.; **Standard X-Ray Co.,** Chicago, Ill.; and **Universal X-Ray Products, Inc.,** Chicago, Ill.

★ ★ ★

NEMA was formed twenty-nine years ago. Its aims are: "To promote the interests of the public in manufacturing, engineering, safety, transportation, and other problems of the electrical industry, as well as: (1) To increase the amount and improve the quality of electrical service to the public; (2) to promote the standardization of electrical products; (3) to collect information relating to the industry and to disseminate it to members of the Association and to the public; (4) to cooperate with governmental departments and agencies regarding matters affecting the industry; and, (5) to promote a spirit of cooperation among the members in attaining improved production, enlarged distribution and increased efficiency of the use of electrical products.

Appointed New York, Connecticut Field Engineer for Hunter Spring

Edward B. Courtney has been appointed as field engineer in Metropolitan New York and Connecticut areas by **Hunter Spring Co.,** Lansdale, Pa. Courtney has been Inspection Foreman at Hunter for the past five years and in that position attended special courses in Statistics and Quality Control at Temple University. His experience of 21 years in Hunter's production, inspection and quality control departments will be helpful to users of springs, stampings, wire forms, and the company's new special spring products.

To Manage Worcester Operations for AS&W

Stephen B. Metcalfe has been named manager of operations of the Worcester District of **American Steel and Wire Division of U. S. Steel Corp.,** succeeding **George A. Gleason,** who is retiring after 38 years of service with this Division.

It will pay you
to get samples of
PLYMKRAFT
IMPROVED CABLE FILLER
To keep up to date on cable filler developments, it takes only an inquiry for samples of PlymKraft. This improved type of twisted paper is available in the exact put up that works best on your equipment, with any type of treatment applied—wax, jute saturant, anthracene.
It is made to fine tolerance, always uniform, and backed by the Plymouth Cordage Company, known as the makers of top quality products since 1824.

Write to:

PLYMOUTH CORDAGE COMPANY

Plymouth, Massachusetts

Mr. Gleason started with American Steel and Wire in the drafting department at South Works in Worcester and held a number of key positions before being appointed district manager of operations in 1945.

★ ★ ★

Mr. Metcalfe is a native of Knoxville, Tenn. He attended primary and high school in California before matriculating at the University of California. He completed his education at the Massachusetts Institute of Technology where he was graduated with a B. S. Degree in mining and metallurgy in 1923.

★ ★ ★

He joined the New Haven Works of American Steel and Wire in 1929, and following a training period, became a foreman in the wire rope department in 1932. Two years later he was promoted to division superintendent of the rope mill there, and in 1938 was made superintendent of Trenton Works. In January, 1942 he was appointed general superintendent in charge of both the New Haven and Trenton plants, transferring in 1945 to the Cleveland headquarters on a special engineering assignment. He returned to his post as general superintendent of New Haven and Trenton in 1948 before assuming the position of assistant district manager of operations in the Fall of 1953 with offices at Worcester.

Firth Sterling Appoints Three Carbide Engineers

To provide better customer service through expanding its field engineering facilities in key marketing areas, **Firth Sterling Inc.** has announced the appointment of three carbide service engineers in the firm's Birmingham, Hartford, and Los Angeles Districts. They are respectively **R. W. Guenther, D. P. Cameron,** and **Jack Glenday.**

★ ★ ★

Mr. Guenther studied engineering at the University of Cincinnati, was associated with Wright Aeronautical Corporation for five years as a training school instructor, and later acquired experience in the automotive and jet engine industries. Before joining Firth Sterling, where he is headquartered in the Birmingham District, Mr. Guenther was a carbide engineer for another carbide producer.

★ ★ ★

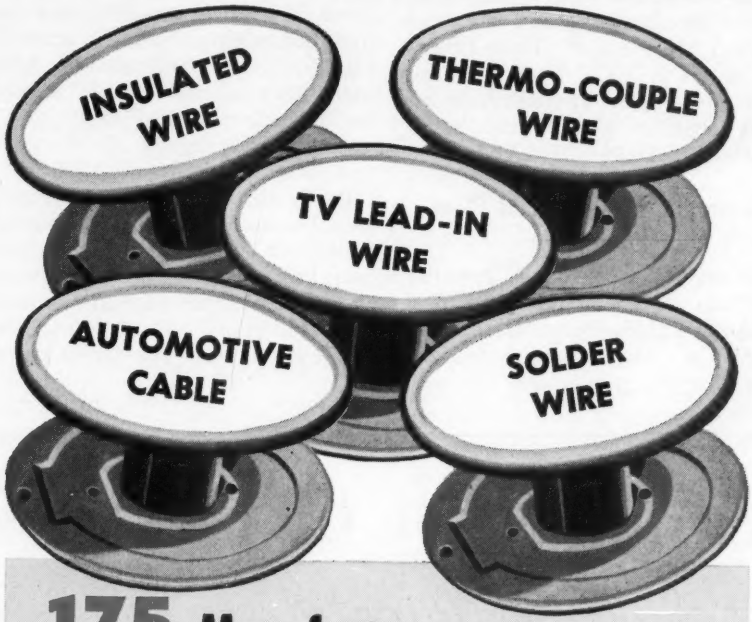
Mr. Cameron became associated with Firth Sterling after thirteen years with the New England Carbide Company, during which time he advanced from shop through sales to Sales Manager. His new location is Firth Sterling's Hartford District.

★ ★ ★

Mr. Glenday joined Firth Sterling following two years as a salesman for Dawson Tool & Abrasive Company of Seattle. Previous experience included three years of engineering and seven years in the field of general machine tools. As a carbide service engineer he will represent the firm in the Los Angeles area.

L.O.F. Glass Fibers Appoints Southwest Manager

Robert E. Simpson has been appointed Sales Manager of the Southwest Region with headquarters at Houston, and **Robert N.**



175 Manufacturers say MASON Spools are best—for less!

These manufacturers specify Mason lightweight, non-returnable, lithographed Spools for performance, appearance and cost!

And while Mason Spool performance speaks for itself, the appearance of Mason Spools speaks for *you* with rich, colorful lithography that assures *instant brand recognition.*

Mason lightweight, non-returnable Spools are available in 5″, 6½″, 8½″ and 10½″ head sizes. All sizes are available with 1⅜″ (Dia.) barrels. The 10½″ head size is also available with a 3½″ (Dia.) barrel. Barrel lengths from ⅝″ to 14″.

Let us know about your spool requirements *now!* Telephone East Providence 1-2810 or write to the address below.

MASON CAN COMPANY

1949 Dexter Road, E. Providence 14, R. I.
Branch Plant — Greenville, Ohio

Heyman was made District Manager of the Dallas area for the **L.O.F Glass Fibers Company,** it has been announced by **J. M. Johns,** Vice President and Director of Sales.

★ ★ ★

Mr. Simpson was formerly with Glass Fibers Inc., where he held the positions of Atlanta Regional Sales Manager, Atlanta Branch Manager and Detroit sales representative.

★ ★ ★

Mr. Heyman was with Glass Fibers Inc. for 2½ years before it merged with L.O.F Glass Fibers on March 1, 1955. Two of those years were spent as Southwestern sales representative, with headquarters in Dallas, Texas.

General Cable To Build Plant In Illinois

To serve the constantly growing demands of telephone companies, **General Cable Corporation,** the country's largest independent manufacturer of telephone wires and cables, will construct a modern new plant in Monticello, Illinois, according to an announcement mede by **I. T. Bennett,** Chairman of the Board, and **J. R. MacDonald,** President of General Cable.

★ ★ ★

Approximately 35 acres in Monticello have been acquired for a modern plant specifically designed to meet the expanding requirements for paper telephone cable. Construction of the new plant will start immediately. It will occupy some 50,000 square feet and be equipped with completely modern manufacturing facilities. A Wabash Railroad siding will adjoin the property.

★ ★ ★

R. E. Riggin, presently Assistant Plant Manager at General Cable's St. Louis factory, will take over the management of the new plant. "It is expected that the new plant will employ about 100 people at the start. With the exception of a few technical people, it is likely that all of them will be recruited locally", said Mr. Riggin.

★ ★ ★

"This new manufacturing facility will increase General Cable's production of paper telephone cable by approximately 25%", Mr. MacDonald, President of the corporation said. He went on to state that the initial plant facilities, specifically designed for manufacturing telephone cables, will be completed by November and in full operation by the end of the year. New units will be added as necessary to meet the needs for additional production of General Cable products.

★ ★ ★

With the completion of the Monticello plant, General Cable will be operating eight factories. The other plants are located in Bayonne and Perth Amboy, N. J.; Rome, N. Y.; St. Louis, Mo.; Los Angeles and Emeryville, Cal; and Providence, R. I.

CAMDEN WIRE CO., INC.

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Producers of Quality Fine Wire Copper Conductors

EXTRA FLEXIBLE CONDUCTOR STRANDED OR BRAIDED

MULTIPLE ENDS OF SIZES .008 to .002

BARE • TIN or LEAD COATED • SILVER PLATED

Special Heavy Tinned Conductors for Hook-up Wire

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Century-Old Wheeling Suspension Bridge To Be National Monument

Plans are underway for memorial rites at historic Wheeling Suspension Bridge in recognition of the contributions of engineering to the United States, and to the ingenuity of the master bridge builder, **John A. Roebling,** who redesigned and built the structure in its present form.

★ ★ ★

An initial meeting to formulate plans for the occasion was held on July 11 at the Wheeling Steel Building, attended by a group of prominent engineers, representing the Wheeling Chapter of the West Virginia Society of Professional Engineers and the counterpart of the organization in Ohio, and others interested in the project. Those in attendance were: **M. D. Ayres,** chief engineer, **Wheeling Steel Corporation; Otis Bledsoe,** engineer, **Hanna Coal Company; R. C. Bundy,** works engineer, **E. I. du Pont de Nemours Company; R. S. Carnahan,** personnel director, **Wheeling Steel Corporation; Lloyd A. Chacey,** executive secretary, **Ohio Society of Professional Engineers; George L. Cobb,** chief engineer, **Columbia-Southern Chemical Corporation. A. C. Flanders,** metallurgical engineer, **Wheeling Steel Corporation; Frank H. Frazier,** St. Clairsville; **Douglas T. Greth,** engineer, **Union Metal Manufacturing Company; Thomas A. Grove,** engineer, **Hanna Coal Company; William K. Hanna,** Cincinnati district manager, **John A. Roebling's Sons Corporation; Thomas Henderson,** engineer, **Hanna Coal Company; Robert A. Heyl,** vice president, **Seabright Construction Company; Paul J. McCullough,** engineer, **Cadiz Water and Sewage Department; R. A. Mudge,** chief draftsman, **Wheeling Steel Corporation; Guy E. Neeper,** engineer, **Lucas Company; Albert Neroni,** advertising manager, **John A. Roebling's Sons Corporation; Forest Thaxton,** mining engineer, **Hanna Coal Company.**

★ ★ ★

Messrs. Ayres, Carnahan, McCullough, Bledsoe and Neroni were appointed to the working committee.

★ ★ ★

The memorial will be in the form of a large bronze tablet suitably inscribed and provided by John A. Roebling's Sons Corporation of Trenton, N. J.

★ ★ ★

Repairs to the present bridge are planned in order to keep it in use. The memorial ceremony is planned for shortly after these repairs have been completed.

★ ★ ★

The century-old span was constructed during the period when West Virginia still was a part of the state of Virginia.

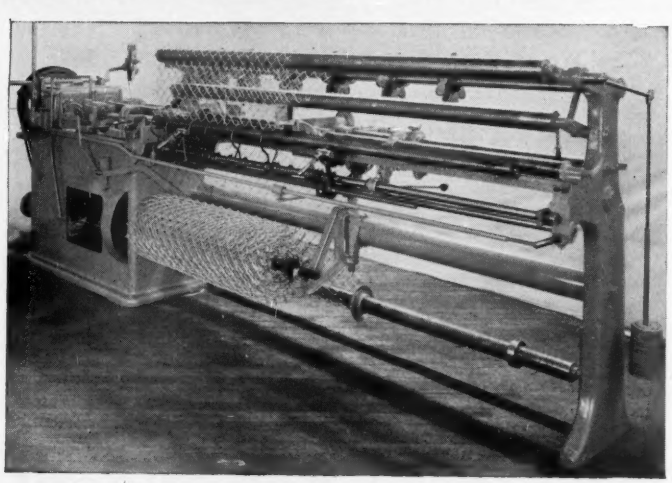
★ ★ ★

Wheeler Announces Appointments

The election of **Edward F. Lazar** as vice president and general manager of **Wheeler Insulated Wire Company,** tops a number of organ-

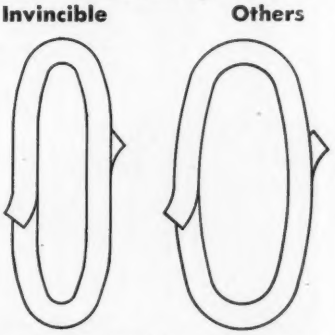
INVINCIBLE Chain-Link Fence Machines • **Greatest in Wire Fencing!**

"SEEING IS BELIEVING"
Come and See It—Advise When



Keeps its form best against rough usage

End view of the Spirals:
Invincible Others



In weaving the two wires there are 4—½ turns per mesh.

Invincible's high production cuts the wage cost. It also saves power, floor space, and WIRE. With normal care the Invincible's Modern Construction gives a long life. Our capacity in building Invincibles is as yet limited. It is the machine you will "eventually buy". It gives a real chance for an increase in profits. It will pay to get in on one quickly.

ARTHUR BLASHILL & COMPANY
Temporary Office: 78 Downing Street
WORCESTER 10, MASSACHUSETTS, U. S. A.

izational changes affecting personnel of the local division of **Sperry-Rand Corporation.**

★ ★ ★

In addition to Mr. Lazar the changes include the appointment of **Angus G. Nicholson** as manager of the electronic products division; **Eldredge H. Welton,** manager of the wire division; **Randall R. Baker,** sales manager in the electronic products division; **Marshall J. Murphy,** manufacturing superintendent; **Paul C. Armor,** chief engineer; **Kenneth C. Fraser,** manager of manufacturing, wire division.

★ ★ ★

The organizational changes call for the formation of two separate operating divisions for the sale and manufacture of the company's line of wire products. A new electronics product division will be responsible for the manufacture and sales of transformers, electronic assemblies, sound-powered telephones, wiring harnesses and other electronic products. The film and yard insulated wire products will be handled by the newly-formed wire division.

★ ★ ★

Mr. Lazar, who will succeed **George B. Horn** as vice-president and general manager, has been associated with the Sperry Gyroscope Company since 1933. He held several executive assignments until Mr. Horn's recent retirement opened the way to his promotion to the top executive position of Wheeler Wire.

Townsend Makes Executive Changes

Townsend Company, one of the nation's oldest and largest producers of cold formed parts and fasteners, today announced four new executive appointments effective September 1st.

★ ★ ★

Howard E. Chilcoat will retire as vice president-general sales manager and will transfer to Santa Ana, California, to fill the newly-created post of West Coast sales manager, while retaining his vice presidency.

George A. Bentley, formerly Central Division manager in Detroit, will become general sales manager with headquarters here.

★ ★ ★

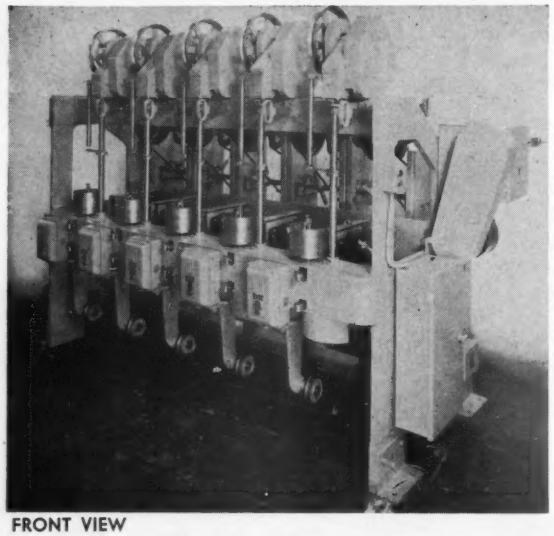
Robert E. Casner will leave his post as general superintendent at Townsend's New Brighton plant to assume Bentley's former position in Detroit. **John W. Hernlund,** former western aircraft sales manager, will take over at the New Brighton plant as works manager.

Carpenter Steel Announces Promotions and Retirements

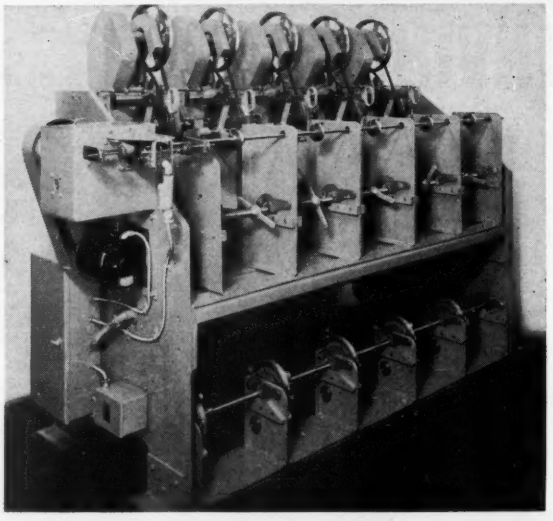
The Carpenter Steel Company, Reading, Pa., has announced the election of two vice presidents to the board of directors, promotion of its metallurgical chief to a vice presidency, and resignation of a senior director.

★ ★ ★

H. Sturgis Potter, vice president in charge of sales, and **Arlington A. Britton, Jr.,** vice president in charge of production, were elected



FRONT VIEW



Celebrating our 100th Anniversary

#2S-5-MBB INSULATION WINDING MACHINE

APPLIES SINGLE COVER TO 5 LINES OF WIRE SIMULTANEOUSLY. NOMINAL WIRE RANGE #15 TO #25 B & S GAUGES (.057" TO .018" OR 1.450 TO .455MM). STANDARD CAPSTANS 8" DIAMETER, BUT MACHINE ILLUSTRATED IS SPECIALLY ARRANGED WITH 12" DIAMETER CAPSTANS, IN PLACE OF STANDARD 8", FOR HEAVIER WIRES. SUPPLY WIRE LET-OFFS AND TAKE-UPS ARE AT REAR OF MACHINE.

EST. 1855 AIMCO INC. 1915

"American" AIMCO INSULATING MACHINERY COMPANY

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to the board of directors. Both will continue in their position as vice president.

★ ★ ★

Dr. Carl B. Post, head of the Metallurgical and Research Departments, was promoted to vice president in charge of metallurgy. **Berton H. DeLong** has retired from the Carpenter board of directors.

Detroit Steel Moves Chicago Office

Detroit Steel Corporation announces the removal of the Chicago District Sales Office from 1601 S. Wolcott Avenue to quarters of its own at 3611 W. Devon Avenue, Chicago. At the former location it shared office space with the company's Reliance-Midwest distributing and processing plant.

★ ★ ★

The new office will serve the company's direct mill customers in the Chicago district. **A. J. Rousseau** continues as District Manager. He will be assisted by **Jack Witzig, Jr.,** Sales Representative, recently transferred from Detroit.

George H. Seybold

George H. Seybold, head of **Seybold Transworld Exporters,** 122 East 42nd St., New York 17, N. Y., died suddenly early in August. His company represented a number of well-known wire machinery manufacturers.

George W. Lucas

George William Lucas, 46, supervisor of carbide materials and process engineering, **Carboloy Department of General Electric Company,** Detroit, and a pioneer in the development of cemented carbide metals in the United States, died suddenly, July 28.

★ ★ ★

Mr. Lucas, who joined the Carboloy organization 27 years ago, was one of a handful of men who formed the organization in Cleveland, O., when it was known as Carboloy Co. Inc.

★ ★ ★

A research scientist who came up the hard way, he was responsible for the development, through the process of powder metallurgy, of the first standard grades of cemented carbides to be commercialized in the United States. He was the holder of several basic patents involving the processing of carbides.

THE WIRE ASSOCIATION

invites wire men to join the organization and participate in its activities.

Write for a booklet on what it is and how it functions to

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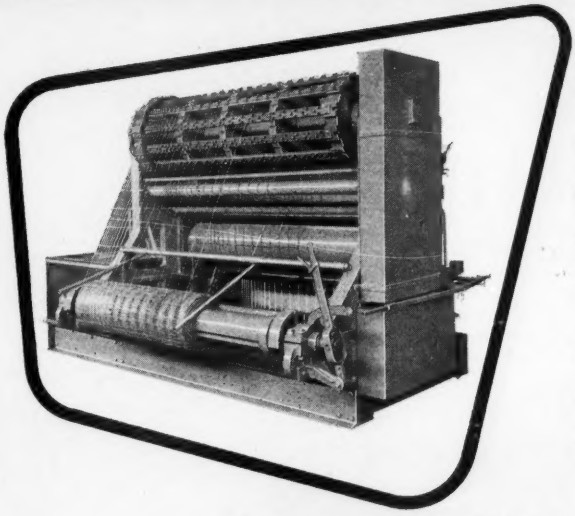


- Fastest — Most Efficient
- Preferred by Leading Mills
- Low Maintenance Cost
- Wrapped Stay Fence
- Straight Stay Wires
- Integrated — Space Saving
- Replaceable Main Bearings
- Single or Double Strands
- Years of Low Cost Production

Write for Detailed Information — Without Obligation

Interlocking Fence Co., Box 8, Morton, Ill.

Specialists In Fence Looms

A Review of Recent Wire Patents

The data listed below is only a brief review of recent patents pertinent to the readers and subscribers of this publication.

Complete copies of these patents may be obtained by writing to the publisher of this magazine and remitting 50¢ for each copy desired. For orders received from outside the United States the cost will be $1.00 per copy.

No. 2,712,444, DETACHABLE LINK AND HOOK GAME-PIECE, patented July 5, 1955 by Lawrence E. Reed, York, Nebr.

The links may be composed of crescent-shaped portions of wire.

★ ★ ★

No. 2,712,657, MACHINE FOR THE MANUFACTURE OF WIRE TACKS, patented July 12, 1955 by Hans Stutzer, Koln-Bickendorf, Wilhelm Wattler, Koln-Zollstock, and Matthias Hermann, Koln-Raderberg, Germany.

There is provided new means for reducing the shank of the tack, which is operated several times in the production of a single tack, and a gripper member operated in synchronism with the shank-reducing means.

★ ★ ★

No. 2,712,835. MACHINE FOR MAKING PARTLY OPEN RINGS, patented July 12, 1955 by Peter M. Sampatacos, Torrington, and Edward E. Franks, Jr., Litchfield, Conn., assignors to The Torrington Manufacturing Company, Torrington, Conn., a corporation of Connecticut.

Partly open stout wire rings are manufactured by this machine, operating in cycles, during each cycle of which two rings are formed. The machine is adjustable, so as to manufacture rings of various sizes. The rings may be so-called hog rings.

★ ★ ★

No. 2,712,836, COIL WINDING MACHINE, patented July 12, 1955 by Robert G. Marzoff, Snyder, N. Y.

There are twelve claims to this patent for a machine which may be employed for winding coils for electrical motors. Objects of the invention to provide new arrangements for starting the winding, completing the winding, and removing the finished coils from the machine, all with a minimum of labor.

★ ★ ★

No. 2,712,837, WELDED WIRE MESH FABRICATING MACHINE, patented July 12, 1955 by Harry E. Griesemer, Bloomington, Ill., assignor to Northwestern Steel and Wire Company, Sterling, Ill., a corporation of Illinois.

Line wires are trained over the cross or stay wires and are welded thereto without interrupting the operation of the machine. There are seventeen claims.

★ ★ ★

No. 2,712,838, WIRE KNOTTER, patented July 12, 1955 by Albert R. J. Luke, Toronto, Ontario, Canada.

The knotter is adapted for use with hay balers and the like. It is stated a wire knot is tied which will not unwind.

★ ★ ★

No. 2,713,464, WIRE COIL FLIPPER, patented July 19, 1955 by John P. King, North Haven, Conn., assignor to The Alfred B. King Company, North Haven, Conn., a corporation of Connecticut.

This is a device for handling coils of wire or strip material and includes a head member, a ram secured at one end to the head member and projecting therefrom so that its free end may extend through a coil, a support for the head by which the latter is removably carried, a holder on the support and head to hold the ram in a horizontal position, and a drag pivotally attached to the head below the ram to extend outwardly along the ram, this drag being pivoted closely adjacent the ram and foldable to a

Here is the difference between just any reel and MPS reels with
DURA CURL RIMS
Yes, it's the exclusive MPS heavy duty thickened-section rims that assure maximum strength and rigidity throughout the reel heads. Flange run-out and straightening expenses are eliminated by this patented MPS development. DURA-CURL rims are now standard on all MPS wire drawing, annealing, and stranding spools and reels. We invite your inquiries — let us tell you more about Dura-Curl rims.
MPS
trouble-free winding spools and reels
Mossberg PRESSED STEEL Corporation
18 WEST STREET • ATTLEBORO • MASSACHUSETTS, U. S. A. TEL ATTLEBORO 1-0848
JAMES DAY (MACHINERY) LTD. 28 MADDOX STREET, LONDON W. 1, ENGLAND

position in proximity thereto.

★ ★ ★

No. 2,713,883, SCREW WITH REINFORCED DRIVER SOCKET AND COUPLED LOCK WASHER, patented July 26, 1955 by Ougljesa Jules Poupitch, Itasca, Ill., assignor to Illinois Tool Works, Chicago, Ill., a corporation of Illinois.

At the juncture of the head and shank is a fillet, the material of which is adapted to strengthen the otherwise weakened cross section between the shank and the bottom of the screw driver-receiving recess of the head. The lock is disposed at the fillet.

G. E. Opens New Research Facilities

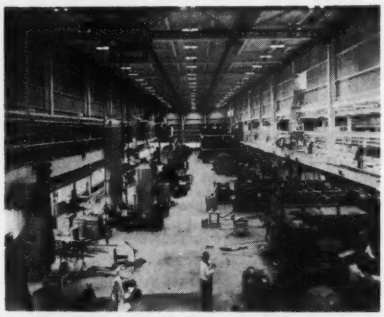
In August the **General Electric Company** dedicated its new Metals and Ceramics Research Building, described as the world's most complete metals and ceramics processing laboratory.

★ ★ ★

The dedication ceremonies included a week-long program of conferences and seminars attended by leading scientists, educators and representatives from G. E., operating components to be served by the new laboratory.

★ ★ ★

This laboratory, which cost $5,000,000 to build and equip, is



Interior view of high-bay area of the new Metals and Ceramics Building at the General Electric Research Laboratory. "Mezzanines" (center background), supporting pilot-plant apparatus, are tied to the main structure of the building. At the left corner of the building in the background is the one-ton, three-phase arc furnace. Other major items of equipment visible from the picture include a large drop forge hammer and an extrusion press (on the left), and the reversing rod and strip mills and industrial heating equipment (on the right). * * * *

part of a $13 million expansion program of research facilities at Schenectady, N. Y. In it will be developed new data and processes that, it is hoped, will be invaluable to industry and the general economic welfare of the nation.

★ ★ ★

Equipment includes a new reversing rod and bar mill believed to be the first to be equipped with a rectifier drive. Through it, the economics of rectifiers versus motor-generator sets for such mills will be studied. A feature of the drive is its ability to accept pumpback current from the mill during reversal, speed of reversal being important in rolling hot metal. Reversal from top speed in one direction to top speed in the other in 2 seconds was demonstrated.

★ ★ ★

As G. E. is one of the leading users of metals, the research projects will be important to the company as well as to industry in general. As an example, it is stated that G. E. purchased over 50,000 tons of copper in 1954, not including the ingots and copper products bought by operating components. G. E.'s annual copper

purchases exceed $31 million, about 7% of all copper offered on the U. S. market each year.

★ ★ ★

Anodic Wire Cleaning

This description of the results of anodic cleaning appeared in the May 25, 1955 issue of Draht-Welt and was translated for us by Jerome W. Howe, Worcester, Mass.

The Andra-Apparatus was developed to eliminate the difficulties in the processing of wire resulting from the adhesion of residual drawing lubricant. The name is an abbreviation of anodic wire cleaning. The process is electrolytic.

★ ★ ★

Through an electrochemical processing before the galvanizing, acceptable clean surface is aimed at, and therewith the creation of a condition necessary for a well-bonded coating which will withstand mechanical stresses. The apparatus is adaptable to all branches of the wire industry, including wire made of various metals.

Respecting the technical development of this cleaning apparatus, for the obtaining of a cleaner and brighter surface, the economy is also improved, since the apparatus can be constructed as a multiple unit (two, four, twelve or twenty-four strand) according to need. At the same time the passing-through velocity is greatly increased. In spite of this considerable increase in performance, the attrition of material is small and well within acceptable limits.

★ ★ ★

The use of this apparatus leads to the following results: residual drawing lubricant and metal specks are completely eliminated, rough places on the surface are smoothed, and burrs and splines to a great extent removed. This action also extends to the oxide layer which entirely disappears so that the surface of the wire is bright.

★ ★ ★

The tensile and bending properties of the wire are unaffected by this process. The wire is not only properly prepared for galvanizing, but also for coating with lacquer, plastic or fabric, resulting in an improved adhesion of these coatings.

★ ★ ★

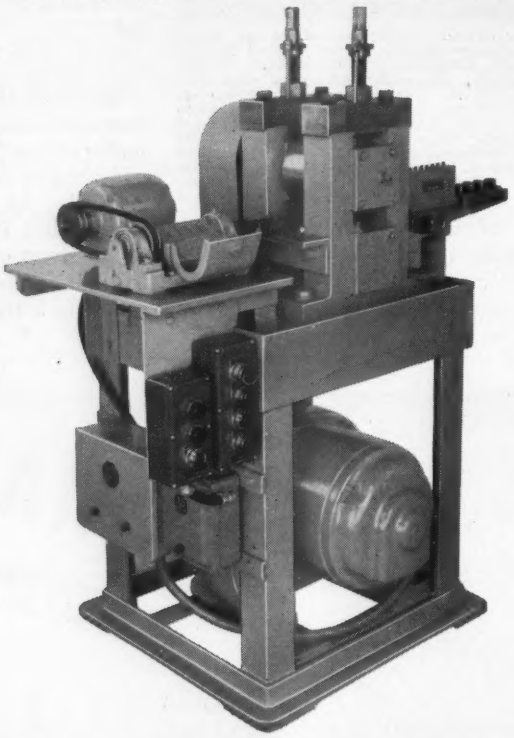
After insulating, the wire so cleaned has higher dielectric strength and in fact can be satisfactorily insulated with a diminished thickness of insulation. Damage to the dies is lessened and cleaning of the dipping baths is rendered unnecessary. In the case of wire made of the more valuable metals, the loosened metallic particles are recovered and the loss of metal is reduced.

★ ★ ★

In practice, the anodic cleaning apparatus has in one plant fulfilled all expectations, not only with respect to efficiency in cleaning and polishing, but also in economy. In another plant an output of 15 meters per minute was demanded. This was attained without difficulty. Even more, this performance in continuous operation was more than doubled without impairment of a uniform cleaning and

New

ROCKWELL *Flat Wire* ROLLING MILL



a Completely Packaged Mill Ready to Run

- For cold reduction of round wire to flat wire.
- Removes kinks, bends and peripheral cast from coil before the wire is cold reduced, and polishes it to produce bright straight wire.
- Prevents wandering which causes crooked finished wire.
- Rolled flat wire passes through edging rolls which keep it in alignment and also smooth and brighten the edges.
- Unique roll design reduces maintenance.

Write for further information

ROCKWELL SINCE 1888 BUILT

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polishing of the surface. Here also it was shown that without doubt the cleaning by this process has a favorable effect upon the subsequent finishing of copper wire and that with proper technical attendance and care of the installation the expected economy will be realized. In still a third plant, wire that was formerly discarded could be reclaimed by the anodic process.

Automatic Aircraft Wire Machine Cuts Time, Waste, Costs

An automatic aircraft wire preparation machine capable of producing aircraft wiring in one instead of four operations is now in use at **North American Aviation's** Los Angeles plant.

★ ★ ★

The machine, which cuts production time to one sixth what it was before, was designed and built by **Artos Engineering Company,** Milwaukee, Wis., under an Air Materiel Command contract.

★ ★ ★

The Artos machine, which is expected to replace rotary bench wire stripping, was put through extensive tests and evaluation production runs by North American engineers as part of the AMC contract.

★ ★ ★

Modifications and improvements resulting from these tests were incorporated in the machine by engineers from both companies during this test period. It is now being used in North American Sabre Jet and Super Sabre production.

★ ★ ★

In one continuous operation, the machine measures accurately to length, numbers at both ends, cuts and end-strips multi-strand glass-braid single conductor wire, and shuts off automatically at the end of a run. In addition to the savings realized in man-hours and time, the Artos machine has cut waste resulting from rejected parts to almost zero.

★ ★ ★

Glass-braid type wire now used in modern jet fighters is difficult to consistently end-strip to required quality specifications using conventional rotary bench stripping equipment. Consequently, current time standards for stripping operations are extremely high.

★ ★ ★

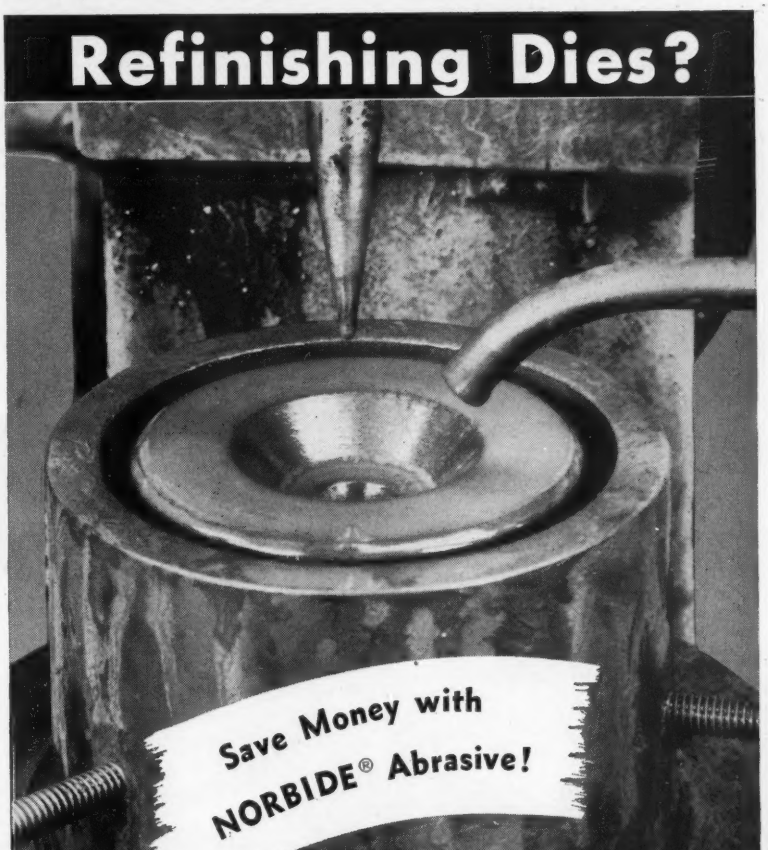
The machine requires one operator who does his own setting-up for a production run. Spools holding various gauges and types of wires are mounted at one end of the machine.

★ ★ ★

The operator threads wire from one of these spools through a series of four weighted pulleys to the measuring wheel and from the measuring wheel to the numbering heads which mark the wire at both ends and on two sides. The wire then is pulled through the cutting and stripping knives and deposited in a long rack ready for bundling.

★ ★ ★

Changing from one order run to another takes about one minute. To change from one gauge wire to another takes about five minutes because the stripping knives have to be replaced.



You may never use a wire drawing die this large, but no matter what size dies you're refinishing, you can save money by using NORBIDE Abrasive — rather than costly diamond dust — for ripping or fast stock removal as well as for accurate semi-finishing operations. For details, write for Form 559.

NORTON
BORON CARBIDE

NORTON COMPANY
New Bond Street
Worcester 6, Mass.

Wire Firm Buys Ottawa Steel

L. A. Young Spring & Wire Corp., of Detroit, has announced purchase of **Ottawa Steel, Inc.**, Ottawa, Kan., for more than $1,000,000. To be known as Ottawa Steel division, the new holding is expected to hit sales of $3,000,000 this year and $5,000,000 in 1956.

★ ★ ★

Young is said to be the world's largest manufacturer of related wire products and is a major automotive parts supplier. It operates sixteen plants in the United States and Canada. The new division, which produces a line of hydraulically-operated implements for use with industrial tractors, will be headed by Edwin L. Johnson, previously associated with the management of Ottawa Steel.

New Tamper-Proof Electric Productimeter

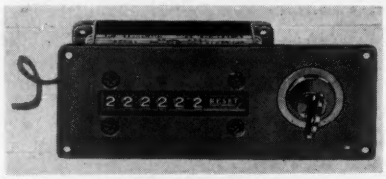
Announcement is made by the **Durant Manufacturing Company**, Milwaukee, Wis., of the addition of a tamper-proof, tumbler-lock reset electric counter, Model 6-Y-1-2-MF to its line of electrically operated Productimeters.

★ ★ ★

Model 6-Y-1-2-MF is designed for panel mounting, and comes equipped with mounting plate, the lock reset being at the right of the plate. The entire assembly can be placed into a panel directly from the front and securely fastened from the front. The counter is totally enclosed, affording great protection against dust and moisture conditions.

★ ★ ★

Overall dimensions are: 5½" long, 2-9/16" deep and 2-1/8" high. Figures are 9/64" wide by 3/16" high, white on dark background. The number wheels are



Model 6-Y-1-2-MF Panel Electric Productimeter with tumbler-lock reset

high in the window for maximum visibility. Hardened steel working parts used throughout assure long life and dependable service. The operating speed is up to 1000 counts per minute. Standard voltage is 110V., 60 C., AC. Voltage fluctuations on normal industrial circuits have no effect on the accuracy of this unit.

★ ★ ★

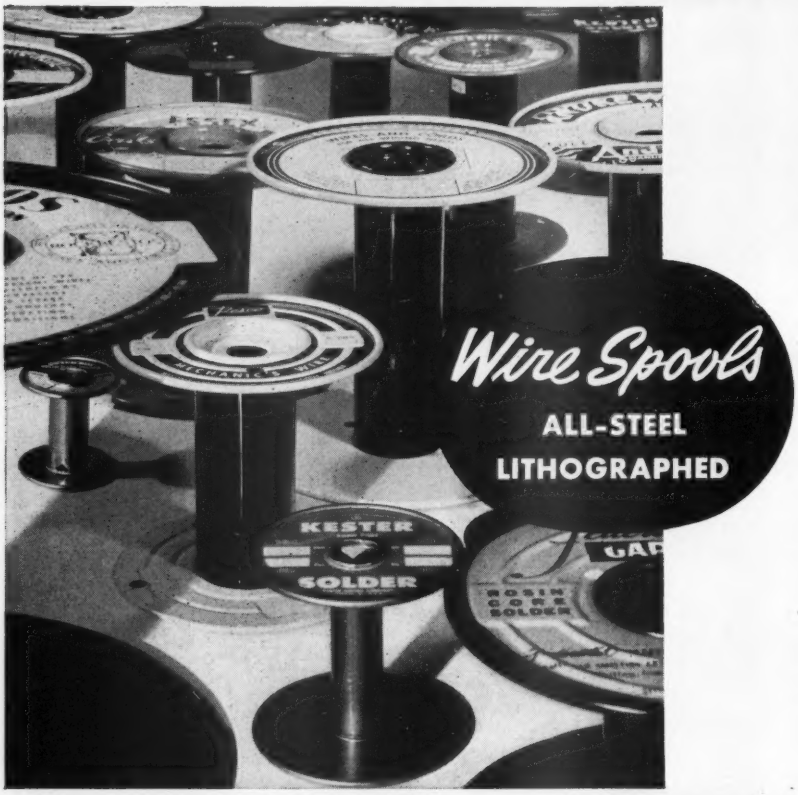
Model 6-Y-1-2-MF is the first moderately-priced lock reset panel electric counter on the market. Figures cannot be changed without the key, a tamper-proof feature that assures exact production readings at all times.

★ ★ ★

Complete details are available from the Durant Manufacturing Company, 1918 No. Buffum Street, Milwaukee 1, Wisconsin, upon request.

New Plastic Coated Wire Rope

An all new plastic coated cable made under the name of "Plasteel" has been announced by **Macwhyte Company**, Kenosha, Wisconsin.



Ends and traverses may be shipped separately and assembled easily in your plant on a hand, foot, or power press.
5" and 6-1/2" diameter ends with 1-15/16" diameter traverses.
10-1/2" diameter ends with 3-1/2" diameter traverses.
Traverse lengths up to 12"

J. L. Clark
LITHOGRAPHED METAL CONTAINERS

J. L. CLARK MANUFACTURING COMPANY • ROCKFORD, ILL.

It is currently available in sizes 1/16" x 1/8" to 1/4" x 3/8", inclusive, in transparent green, or opaque white. Strengths are from 480 lbs. to 7000 lbs.

★ ★ ★

This new "Plasteel" cable is either a Preformed Galvanized Steel or Stainless Steel Wire Rope, coated with strong, tough, flexible plastic. The thickness of the plastic coating varies with the diameter of the rope.

★ ★ ★

The flexibility of the rope is not adversely affected by the plastic coating. It resists sunlight, oxidation, and provides excellent color stability. It is resistant to most acids, bases, salts, oils and greases, except hydro-fluoric acid and methyl ethyl ketone.

★ ★ ★

Size description of the cable includes the diameter of the cable before coating and the diameter after coating. For example, a 3/32" x 3/16" cable is a wire rope 3/32" in diameter before coating with plastic and 3/16" diameter when finished.

★ ★ ★

Circular No. 5540 and prices are available by writing to distributors or to **Macwhyte Company, Kenosha, Wisconsin.**

Vanadium-Alloy Board OK's Stock Exchange With Pittsburgh Tool

The board of directors of the **Vanadium-Alloys Steel Company,** Latrobe, Pa., approved July 26th, a proposal from the **Pittsburgh Tool Steel Wire Company** of an exchange of capital stock of no par value. Upon approval by their stockholders this will be exchanged on the basis of 1.7 shares of stock of Vanadium-Alloys Steel Company for each of 47,296 shares of the Pittsburgh Tool Steel Wire Company.

★ ★ ★

Manufacturing precision finished bars, including ground squares and flats is the principal business of the Pittsburgh Tool Steel Wire Company. Much of this material is generally made of oil hardening or air hardening tool steels which are produced by the Vanadium-Alloys Steel Company. The products of both companies are non-competitive.

★ ★ ★

Products of the Pittsburgh Tool Steel Wire Company are sold by 330 distributors covering the entire United States. Vanadium-Alloys Steel Company first quality tool and die steels are sold nationwide through district offices and warehouses located in principal cities. Other subsidiaries of the Vanadium-Alloys Steel Company besides the **Colonial Steel Division** are the **Anchor Drawn Steel Company** in Latrobe; **Vanadium-Alloys Steel Canada Limited,** London, Ontario; **Vanadium-Alloys Steel Societa Italiana,** Turin, Italy.

Carbide Thread Cutters Increase Production

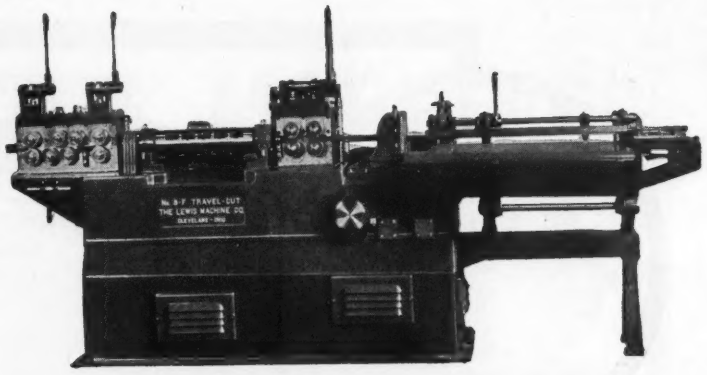
By combining unusual design features with cemented carbide, the screw machine unit of **General Electric Company,** Pittsfield, Mass., came up with a special thread cutter for making 11 1/2-

Fast, Accurate, Economical

STRAIGHTENING and CUTTING

with LEWIS **TRAVEL-CUT**

(Trademark)



23 Models to handle from .012" to ¾" Round, Hex, Flat, Shapes.

Simple in design, rigid in construction, Lewis TRAVEL-CUT will deliver continuous dependable service under the most severe, high production conditions—day in, day out. Feeds wire from the coil, straightens accurately, gauges to uniform length, and cuts clean without stopping the wire. For steel, brass, aluminum and alloy wire. Cut your cutting costs with the Lewis TRAVEL-CUT. Full details on request.

Exclusive Representatives

EAST: Penn Machinery Co., 117 North Third Street, Philadelphia 6, Penn.

MIDDLE WEST: Steel & Wire Machinery Co., 15457 Euclid Ave., Cleveland 12, O.

CENTRAL: Moslo Machinery Co., 2443 Prospect Avenue, Cleveland 15, Ohio.

WEST COAST: Hoffman & Heartt, 3005 So. Grand Ave., Los Angeles 7, California.

CANADIAN: Empire Engineering Co., 738 Dundas St., East, Toronto, Ont., Canada.

CONTINENTAL EUROPE: Gaston E. Marbaix Ltd., Devonshire House Vicarage Crescent, London S. W. 11, England.

The LEWIS MACHINE Company

3441 E. 76th Street, Cleveland 27, Ohio

Also agents in Paris, Stockholm, Rotterdam, Brussels, Zurich, Milan, Bombay and Melbourne

inch pitch pipe threads that cut an average of over 1000 linear feet of threads between grinds, or a total of 30,000 feet during the life of the cutter.

★ ★ ★

A good example of what can be accomplished in "custom-making" tools for specific operations, the cutter is employed on a planetary thread miller in which the work is held stationary while the cutter is cycled automatically inside the work. Interesting feature is that added tool life is obtained for the cutter by including an anti-backlash feature in the machine which permits climb milling.

★ ★ ★

Of inserted tooth design, the cutter is made by the screw machine unit in several sizes to accommodate the work being processed. The inserts, tipped with Carboloy grade 350 carbide, are fastened into the soft steel body of the cutter by a tapered pin method.

The accuracy resulting from using the fixture is considerably within accepted tolerances. Tooth spacing is held to 0.0001-inch between any two adjacent teeth, and 0.0002-inch between any two teeth in the 1 1/4-inch width of the insert. Tooth form of 60 degrees is held within 5 minutes.

New Stainless Steel Design Handbook Offered by Alloy Metal Wire Division

Alloy Metal Wire Division, H. K. Porter Company, Inc. announces the availability of its new 40 page Design Handbook. The handbook covers in detail the properties, specifications, applications and design data on the division's 20 grades of Stainless Steel wire, rod and strip.

★ ★ ★

The general theme of the handbook is "The Functional Selection of Stainless Steels." Complete chapters deal with the selection of Stainless Steels for Corrosion Resistance, Heat Resistance, Mechanical Properties and Spring Properties. Other sections of the book present useful information on Workability, Cleaning and Passivation, Machinability and other techniques and practices.

★ ★ ★

Property, size and weight charts, and other tabular data are also included to enable the design engineer to select the right grade of Stainless Steel for a particular application.

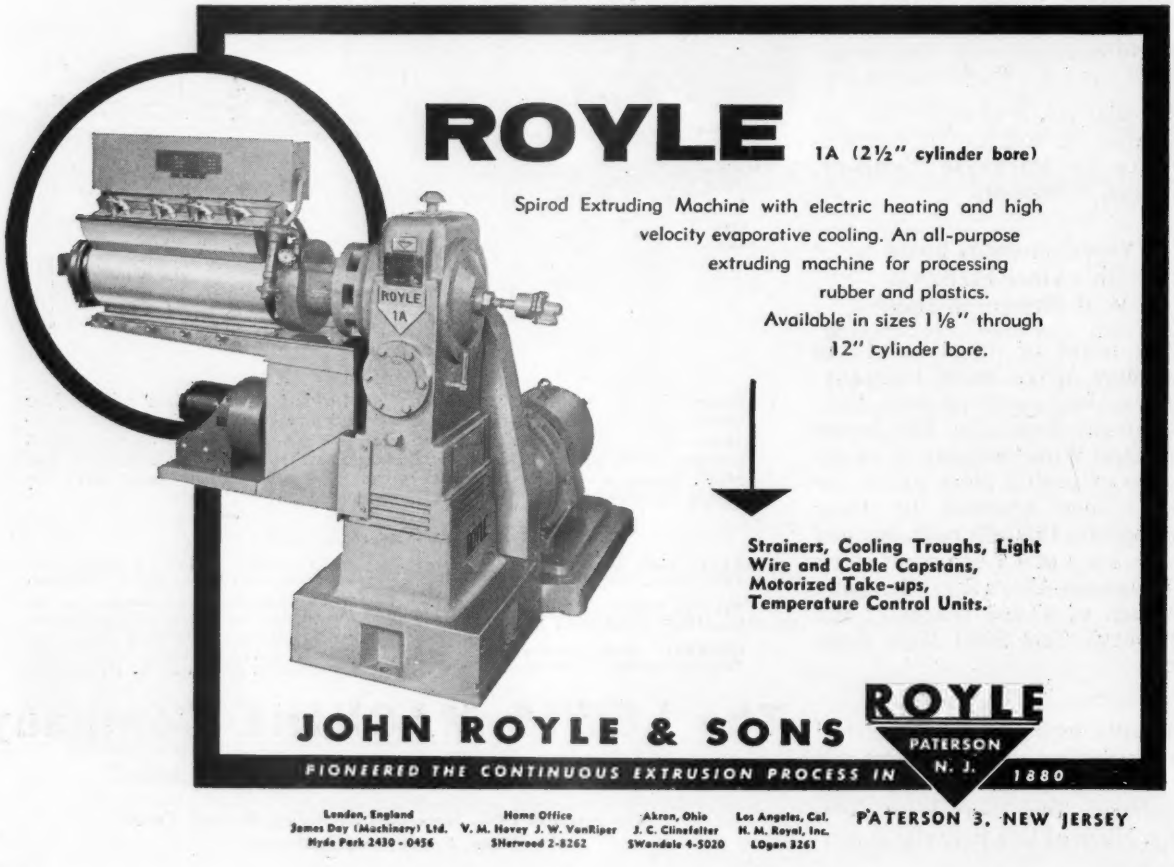
★ ★ ★

The handbook is printed in 2 colors on 8½ x 11" stock and contains over 50 illustrations of typical products manufactured from Stainless Steel, wire rod and strip.

★ ★ ★

Copies of the handbook can be obtained by writing to **E. H. Mann,** Sales Manager, Alloy Metal Wire Division, H. K. Porter Company, Inc., Prospect Park, Pa.

TO SELL—ADVERTISE IN
WIRE AND WIRE PRODUCTS
It pays—send for rates
453 Main St., Stamford, Conn.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1A (2½" cylinder bore)
Spirod Extruding Machine with electric heating and high velocity evaporative cooling. An all-purpose extruding machine for processing rubber and plastics.
Available in sizes 1⅛" through 12" cylinder bore.
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PATERSON 3, NEW JERSEY

Butyl Polymer Compounding for Insulations

(*Continued from page* 1015)

(2) In butyl stocks you can make or destroy electrical properties in your internal mixer. It is not so much to consider what you put into the compound, as to how you put your materials together. This is an old, old basic philosophy in insulation compounding, but in the system just discussed the best possible dispersion obtainable is a "must."

(3) We know of no rapid method of incorporating the quinones or red lead so that uniform cures and stable electrical results can be obtained. This is the reason we use master batches of these materials.

(4) The quinone-red lead system is extremely sensitive to variations in pH. The usual antioxidant type of amines retard the cures in open steam. This is the main reason we use FT Black, pH 8.5 or FF Black, pH 9.3. This type of high pH Black, while a mild retarder to prevent scorch, is more advantageous for CV cures than the amines.

(5) The use of sulfur with the quinones seems to aid and smooth the cure in open steam, but in the GMF system it raises the water absorption with resultant progressive degradation of insulation resistance values. This does not apparently happen with dibenzo GMF-red lead system.

LOW VOLTAGE TYPE

Cure System - 2 GMF, 4 Benzothiazyl Disulfide, 6 Red Lead on 100 parts R-35 Polymer

PHYSICAL TESTS - AGEING

Originals		Ageing Results			
		20 Hrs. Air Bomb		7 Days O_2 Bomb - 80°C	
Tensile	Elongation	Tensile	Elong.	Tensile	Elong.
745	622%	728	562%	808	583%
Per Cent Retained		97.7%	90.4%	100%	93.1%

14 Solid-3/64" Wall - CV cured

Insulation Resistance Values

Average (two 50ft. coils) megohms/1000 ft.

Immersion Time	Weeks in Water at 75°C										
	1	2	3	4	5	6	7	8	9	10	11
1 hour-15.6°C - 6900											
24 hours-75°C - 121	- 181	205	193	212	209	229	230	241	233	236	

Stable - 12 to 24 weeks

LIST OF MATERIALS USED

Zinc Oxide—Protox 166—New Jersey Zinc Co.

Whitetex No. 2—Southern Clays, Inc.

FT Black—P-33—Binney & Smith Co.

NIEHAUS WIRE STRANDING ROPE CLOSING CABLE MAKING MACHINES

45 SPOOL

High Speed Stranding Machine for stranding Seale, Warrington and fill-wire type ropes.

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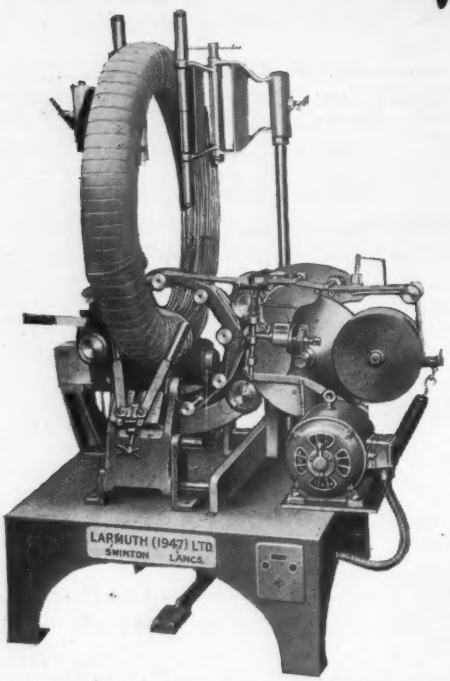

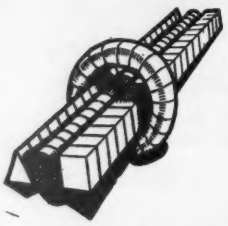

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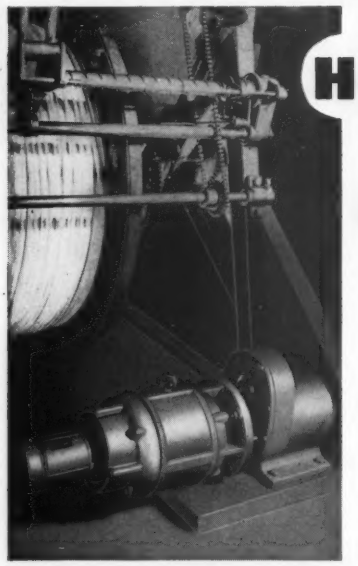

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You can profit from Hobbs-Alquist winding Engineering if you wind ferrous or non-ferrous wire for spooling, respooling for further processing, for tension control of winding or for any other purpose! Hobbs-Alquist alone offers a complete line for winders and winding machinery and a complete winding engineering service.

Ask for the new Hobbs-Alquist Winding Engineering brochure . . . it completely describes and illustrates the winders, winding machinery and the engineering service.

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Polyac—E. I. du Pont de Nemours & Co.

Paraffin—130°—133°F Refined Wax

Softeners—Faxan 40—Enjay Co.

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GMF—Naugatuck Chemical Div., U. S. Rubber Co.

DiBenzo GMF—Naugatuck Chemical Div., U. S. Rubber Co.

Benzothiazyl Disulfide—Altax—Wire Grade—R. T. Vanderbilt Co.

Red Lead—Hioxide Red Lead—Evans Lead Co.

Carboloy Announces Throw-Away Blank Line

A new line of throw-away blanks, both precision and utility, of the new steel cutting grades 350 and 370 carbides as well as of standard grades for nonferrous machining, is announced by **Carboloy Department of General Electric Company,** Detroit.

★ ★ ★

The line covers all ranges of machining from light finishing to extreme heavy roughing to meet every industry demand. The new blanks are made "ready-for-use" on standard mechanical tool holders currently in use.

★ ★ ★

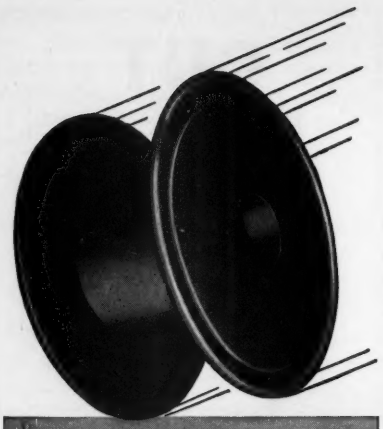
Nine basic sizes with different radii in triangular, round and square shapes are included in the line. Thickness of the carbide inserts is designed to provide users with maximum economy per specific job. Basic sizes are available in different thicknesses.

★ ★ ★

The new line, added to the brazed tool line, now enables carbide users to order from a single source all necessary grades or styles of tools for cutting either steel or nonferrous metals and take advantage of the best features of either the throw-away or brazed tool principles in machining jobs.

New Philadelphia Gear Manual

The completely new Philadelphia Gear Manual includes 76 pages of illustrations, diagrams, definitions, tables, charts and explanations re-



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Apco Mossberg Company has been turning out balanced and true reels for over half a century, beginning as the original Frank Mossberg Company. We have one primary purpose, and that is to design and manufacture better steel reels, spools and bobbins for the wire industry.

Bring your reel problems to us. Our engineering service is equipped to give your problem individual attention. Suggestions and solutions will be offered without obligation. Write today.

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The original Frank Mossberg Company

APCO MOSSBERG CO.
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garding all types of gears. Also, for the first time, there is presented a simplified method of calculating horsepower ratings of all types of gearing.

★ ★ ★

If you design, use or buy gears, you can't afford to be without a copy of this book. Write to **Philadelphia Gearworks, Inc.,** Erie Ave., & G. St., Philadelphia 34, Pa., for Gear Catalog G-655.

I.D.A. Holds Tenth Convention

The Industrial Diamond Association has closed its Tenth Convention and Annual Meeting at Hollywood, Florida, after a session that was more important than usual due to the changing times.

★ ★ ★

The Convention endorsed the viewpoint expressed by the officers and management during the past month on the scientific developments announced by **General Electric Co.** involving the production of synthetic diamonds. This viewpoint was to the effect that the project must be considered strictly in a research stage and that it would be impossible to predict if or when industrial diamonds could be produced commercially on an economical basis. Gem diamonds are even further away in the future as to synthetic production. Therefore, no change in the supply or use of natural diamonds was expected at this time or in the foreseeable future.

★ ★ ★

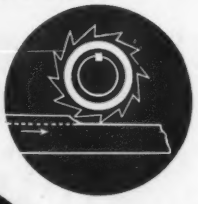
The Association adopted a Code of Ethics geared to modern fair trade, and studied problems of standardization and trade exhibitions along with matters of administrative importance.

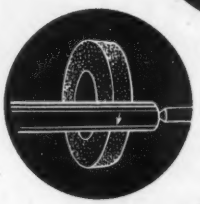
★ ★ ★

The new officers are: President, **Piet Smit, J. K. Smit & Sons,** Murray Hill, N. J.; 1st Vice President, **Jan Taeyaerts, Precision Diamond Tool Co.,** Elgin, Ill.; 2nd Vice President, **Willard L. Huber, Diamond Tool Research Co.,** New York, N.Y. Continuing as Secretary - Treasurer and Executive Manager is **Athos D. Leveridge** of New York. New Directors are: **John W. Cowan, Wayne Wire Die Co.,** Hillside,

4 places to cut costs with Hans C. Bick Lubricants

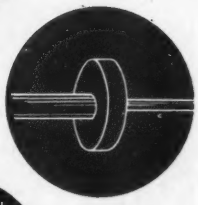
MILLING

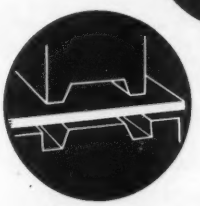




GRINDING

DRAWING





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Take up your lubricant problem with Hans C. Bick and discover how you can reduce costs through increased production and longer life for tools, dies, and abrasives. Bick lubricants and coolants are modern compounds developed by specialists with 23 years' experience. To assure best results, our engineering service is always available to work with you in a friendly, cooperative way. If you machine, form, or grind ferrous and non-ferrous metals, call upon Hans C. Bick now to smooth the way for lower unit costs.

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FOR
EXTRA TONNAGE
FROM YOUR BAR STOCK AND WIRE DIES

COAT WITH
BORAX 5 MOL.

Borax and Borax 5 Mol Offer Many Advantages as a Coating Material

Here is dust-free, granular material that is readily soluble in water and dries quickly. The residual film is tight yet pliable... won't flake off! Borax is safe to use, easy to handle, and non-irritating to the skin. You can feed stock faster and you get longer, more accurate performance from your dies.

Check these advantages of borax-coated stock:

- COMPATIBLE WITH DRAWING LUBRICANT
- BETTER WORKING CONDITIONS
- FASTER BUTT WELDING
- LONGER DIE LIFE
- LONGER STORAGE SAFETY
- CLEANER TO HANDLE IN TRANSIT

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New Cable Announced

A new shuttle-car cable with greatly increased life has been announced by the **Anaconda Wire & Cable Company**, New York City.

★ ★ ★

Shuttle-car cables are ordinarily subject to severe mechanical damage, excessive tension and overload current. According to the Company, failures in the past resulted, not so much from difficulties with the jacket, as from breakdown of the insulation or conductors. This new cable gives physical toughness inside as well as outside.

★ ★ ★

In this cable, a high-grade, heat-resistant neoprene insulating compound recommended for operation at 75°C increases resistance to puncture, crushing and cutting. The jacket is also neoprene.

★ ★ ★

Greater protection against short circuits is provided in the cable by a patented nylon breaker strip. A high-tensile-strength, fibrous, open-weave web is used over the insulation and fillers and under the jacket.

★ ★ ★

Improved stranding of the grounding conductor prevents broken wires and assures continuity of the ground for the life of the cable.

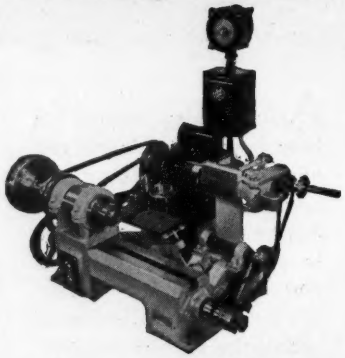
Westinghouse Develops New Wire Insulation

A major step toward smaller, longer-lived, and more efficient electrical equipment has been made by scientists at the **Westinghouse Research Laboratories** through the development of a new insulating enamel for copper wire.

CUT Die Room COSTS 50% with the New type "M"

DYKREX
"IT CORRECTS THE DIE"

automatic Polishing Machine



Double your finished Tungsten Carbide Die production

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Save ½ labor costs—

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The new automatic polisher with the Time Switch—

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It is completely assembled—just plug it in!

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The Standard of the Wire Industry

Laboratory tests on electric motors insulated with the new enamel show that the motors can operate continuously for 10 years at a temperature of 325°F. without damage to the insulation. This length of time is equivalent to the normal operation of a refrigerator motor for 30 years, or a washing machine motor for about a century.

★ ★ ★

Announcement of the new wire enamel was made by **Dr. Jack Swiss,** manager of the insulation department at the Westinghouse Research Laboratories. He named **F. A. Sattler** and **S. H. Langer,** of the insulation department, as developers of the new enamel.

★ ★ ★

The new enamel called "1267" is a modified polyester-type resin containing about 20 per cent silicone and represents the culmination of 10 years of research and development of polyester-type wire coatings. By incorporating silicones into these materials, the company has produced an insulation that can withstand higher temperatures for longer periods of time than any wire enamel that does not contain silicone.

★ ★ ★

The new enamel also has unusual resistance to flow under pressure, which occurs when enameled wire is tightly wound and wedged into the slots of an electric motor. This pressure causes the wire to eventually cut through less resistant insulation and "short out."

Develops New Wire for Tube Grids

A new molybdenum alloy wire, designed for grids in power and receiving tubes, has been developed by **Fansteel Metallurgical Corp.,** North Chicago, Ill. Improved mechanical properties are obtained by controlled small amounts of a cobalt additive to a high purity molybdenum base, resulting in minimized wire breakage on grid winding machines and better stretch properties. Tests are said to have indicated no perceptible difference in electrical properties between this wire and pure molybdenum.

VINYLS for...

CRITICAL CUSTOMERS

For the past ten years we have specialized in the compounding of Vinyl extrusion and injection molding compounds to specifications, or developing compounds for a specific use.

Underwriters' approved standard compounds are available in all colors for POT, T, TW, 80 Degree C, 90 Degree C and 105 Degree C wires. We also have a compound which will meet requirements of Military Specifications MIL-W-5086.

If you require a Vinyl compound rated higher than 105 degrees C for special applications, we suggest you communicate with us, as we may have a compound to meet your requirements.

Your inquiries are invited.

ELECTRONIC RUBBER COMPANY

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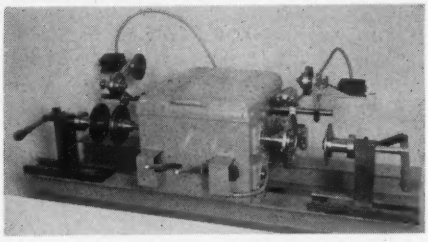

THE BOYD
Model 6025
SPOOLER
PRECISION ENGINEERED

The Boyd 6025 spooler is a precision engineered unit available with one or two spindles.

The traverse mechanism is a single screw, solenoid actuated for positive "no-dwell" reversing which runs in a constant shower of oil.

Traverse lengths are readily adjustable from one-half to eight inches, or longer if desired in a matter of seconds with the machine in operation and can be made for larger spools where customer requirements demand lengthier traverse. Infinite rates of traverse for varying sizes of materials are achieved through easily applied change gears over a great range.

The main housing is of all steel welded construction with cast aluminum cover of drip-proof design. All wear points are protected with anti-friction ball bearings to further enhance the rugged, long-lived features of this machine.

Auto-stop motion at predetermined footages is included as standard equipment on each individually operated spindle along with manual clutch release for emergency stop.

Special power equipment for constant speed or smooth slow starts is available and easily adapted to your needs. Quick release tail stocks can be had as either hand or foot operated while spool adapters can be supplied to cover your entire range of finished package spools.

Send for Full Particulars

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REGULAR ENAMEL OR SELF-SOLDERING
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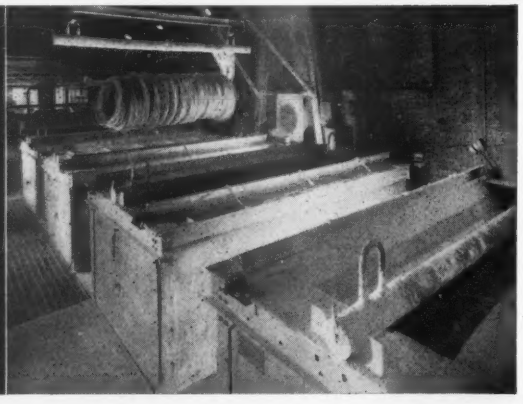
HI-SPEED REGISTERED

ROD BAKERS



Faster baking, greater fuel economy, maximum production efficiency are just a few of the results of the exclusive heating arrangement of the Carl Mayer Hi-Speed Rod Baker. It also has a patented blow-off feature which removes moisture without damage to coils.

Here are just a few of our many satisfied customers:

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Indiana Steel & Wire Co.
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OTHER PRODUCTS: Core Ovens • Mold Ovens • Welding Rod Ovens • Heat Treating Ovens & Furnaces • Special Processing Equipment and Accessories.

Trouble Shooting Charts for Electroplaters

The Joseph B. Kushner Electroplating School announces the **Tank Doctor,** a copyrighted, new type of trouble shooting chart for electroplaters and plating department control chemists. The **Tank Doctor** gives in systematic order, the symptoms, the diagnoses and cures of and for practically any difficulty that can come up in the operation of the specific tank for which it is designed. The chart size is 8" x 10" so that it is quickly scanned by the eye, yet it is extremely comprehensive in detail. The print is easy to read, the instructions easy to follow.

★ ★ ★

Available for immediate delivery are the **Chromium Tank Doctor** which covers both decorative and hard chromium baths, the **Nickel Tank Doctor** which covers bright nickel and Watts baths, and the **Copper Tank Doctor** which covers rochelle and high efficiency cyanide baths. Inquiries regarding these Tank Doctors may be made directly to the Joseph B. Kushner Electroplating School, 115 Broad Street, Stroudsburg, Pennsylvania.

New Color Pigment Dispersions

A new line of ultra-fine color pigment dispersions in paste form, known as the 0100 series, is announced by **Acheson Dispersed Pigments Co.,** 2250 East Ontario Street, Philadelphia 34, Pa. ADP has long been known for producing only the highest quality in pigment dispersions, whether in paste or dry granulation form.

★ ★ ★

Now, by the application of techniques which were developed within the past two years, this new line of dispersions is possible. These new pastes are rigidly controlled in ADP laboratories before being released for shipment. First, an exact color match is held to closer limits than ever before. Next, the particle size is carefully examined and the fineness controlled to match that of the standards already established.

★ ★ ★

Because of the extreme fineness of dispersion, the use of these pastes will result in a considerable saving of equipment time as well as the elimination of a large part of off-color scrap. Once the compound formula is set up to give the correct color on the calendar or extruder, ADP color control will assure that subsequent batches, if made the same way, will produce the identical color.

★ ★ ★

The regular standard line of ADP paste dispersions will still be available at a slightly lower price than the new ultra-fine 0100 series of pastes.

Calculator New Carbide Feed and Speed

A new Slide-type Calculator provides ready answers to carbide tool users for recommended feeds and speeds. It is a Tungsten Carbide Grade selection scale for all ferrous and non-ferrous material, a hardness conversion chart, a horsepower correction factor scale and Tungsten Carbide Manufacturers grade comparison chart. This handy, pocket-size calculator is, in fact, a carbide machining handbook. Calculator measures 4" high and 9¼" long. To obtain copies write: **Willey's Carbide Tool Co.,** 1340 W. Vernor Hwy., Detroit 1, Michigan.

Process Claimed For Spraying Vinyl On Wire Goods

First successful process claimed for electrostatically spray-coating vinyl plastisols on fabricated wire baskets, dish drainer racks, display racks and other wire goods on a production-line basis, was announced jointly by **Scientific Electric,** Garfield, N. J., designer and manufacturer of high frequency and high voltage equipment, and United Chromium division of **Metal & Thermit Corporation,** metal finishing specialist.

★ ★ ★

Electrostatic spraying of plastisol is said to be more than twice as fast as conventional dip-coating, completely eliminates plastisol wastage due to "running," reduces

Internationally known specialists

WIRE DRAWING LUBRICANTS
ELEVATOR and AIRCRAFT CABLE SHIELD
WEATHERPROOF and FLAME-RESISTANT
WIRE COATINGS

COPPER • ALLOYS • ALUMINUM

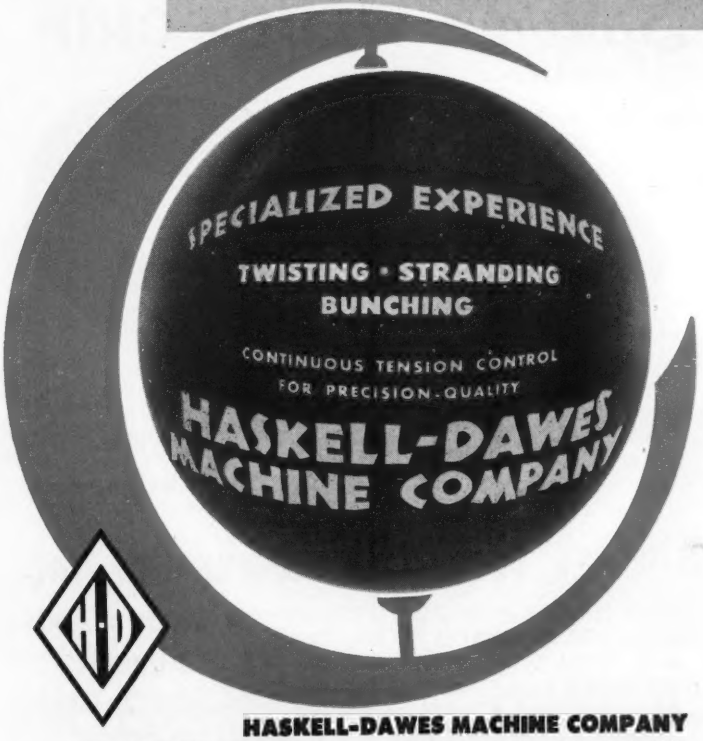
Our experienced staff of lubrication engineers is available for consultation without charge. Write us regarding your special lubrication problems. The Ironsides Company, Columbus 16, Ohio.

SHIELD PRODUCTS

Ironsides

Makers of Palmoshield • "the palm tree that grows in Ohio"

MACHINES FOR COPPER • STEEL • BRONZE ALUMINUM • ALLOY WIRES



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For **EFFICIENT WIRE DRAWING**

ROME SOAP offers a complete NEW line of laboratory-developed, field-tested

WIRE DRAWING LUBRICANTS

for

WET AND DRY DRAWING OF ALL METALS

Steel • Copper • Brass • Aluminum • Alloys

Leading wire mills are reporting superior results in Wire Finishes, Increased Production, and Lowered Costs. They're efficient.

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Used by Wire Men Who Want the Best!

SJOGREN TOOL AND MACHINE CO., INC.

WIRE PULLERS • WEDGE GRIPS • JAWS FOR ALL MAKES OF PULLERS AND TESTING MACHINES • CAGE ROLLERS • SWAGING HAMMERS • POINTING DIES • WIRE SPOOLERS

14 SWORD STREET AUBURN MASSACHUSETTS

the intermittent handling ordinarily required in dip-coating, and produces a superior coating in terms of uniformity and appearance to that obtained by dip methods, it is claimed. The entire operation is conveyorized; the actual spraying is automatic.

★ ★ ★

The process makes use of "Ionic Guns" with newly developed "atomic nozzles" and powered by a 140-K.V.P. ionic high potential power supply to spray an ionized "mist" of plastisol around the object to be coated. The "mist" is able to reach and deposit evenly over the entire surface—inside and out—of intricate wire goods. The equipment is an adaptation of Scientific Electric's standard line of ionic high potential spraying equipment. The plastisol was specially formulated by United Chromium for electrostatic spray-coating.

★ ★ ★

Production rate depends upon the number of guns used on the line—the more guns the faster the work rate. Each power supply can handle up to 12 guns; an average installation would utilize four guns.

Increase in West German Wire Export

The West German export of wire and wire products increased in 1954 by about 60,000 tons, (nearly 20%) over that of the preceding year. All categories shared in this increase, the greatest increases being those for drawn wire, barbed wire and wire nails. Naturally the export varies for different countries. Exports to Belgium and Israel increased more than 100%. Exports to France showed a great increase, and Brazil appeared last year as a large importer of wire rod. The export to Portugal likewise deserves mention.

★ ★ ★

In wire with unfinished surface, the several Schuman Plan countries are important recipients, but Switzerland, Uruguay and India have also increased their imports.

In finished wire the Netherlands have in the past year increased their taking by 40%. The principal outlet however was overseas, India having more than doubled her import of this product from that of the previous year. The total export from Germany increased 25%.

★ ★ ★

In wire rope, Sweden took the greatest amount, with Italy about a third less. Sweden's import from Germany represented a 30% increase. The Argentine import showed a decrease. Canada, on the other hand, took more than double the amount received in 1953.

★ ★ ★

Brazil's intake of barbed wire increased from 3,800 tons to over 20,000, and even the United States import of barbed wire more than doubled and totaled over 7,600 tons. Export of wire mesh increased about 30%, Malaya, South Africa and Venezuela taking the greatest share.

★ ★ ★

The United States, which in 1953 took much the greatest part of Germany's export of wire nails, more than doubled its intake to a total tonnage of 28,700.

—from the May 25, 1955, issue of Draht Welt

G. E. Adding to Insulated Wire Facilities

Work is currently underway at **General Electric Co.'s** Distribution Transformer Dept., Pittsfield, Mass., on a $600,000 building and equipment project for production of resin-insulated wire.

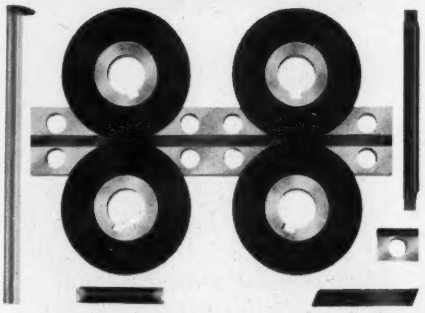
★ ★ ★

The enlarged facilities will manufacture increased quantities of Formex wire for use in transformers and other electrical equipment.

★ ★ ★

Six Formex oven units will be in operation at the plant by July, 1956. Each unit will be able to process about 18,000 lb. of copper wire per week.

CRAFTS ... for LONGER LIFE



Spring coiling machine tools made of tungsten carbide will outlast steel — but unless the grooves FIT your wire ALL AROUND — you are *not* getting *maximum* life.

CRAFTS Carbide Tools are optically ground in special equipment of exclusive design. Grooves are *guaranteed* round and to size . . . to give *complete* support and uniform wear for longest life.

Depend on **CRAFTS** Tools for better springs . . . a quality name since 1928.

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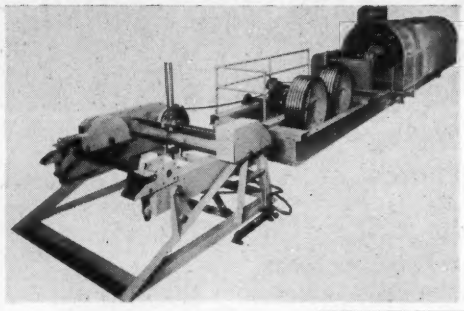
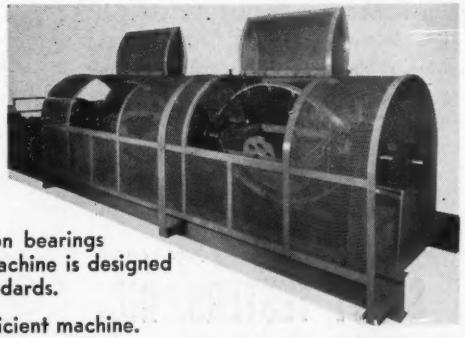
THREE-WIRE HEAVY DUTY TWISTING MACHINE



Built to handle wire from #14 to 500,000 circular mils in size on cradle reels.

Cradle reels either 30", 36" or 48" in diameter.

Rotor speeds from 800 r.p.m. to 30 r.p.m. controlled by gear box and dual drive.



Capstans either single with fleeter sheave or double as shown with diameters of 30", 36" or 42". Rates of lay from 1½" to 36".

Welded steel frame, anti-friction bearings and multiple roll guides. The machine is designed and built to our usual high standards.

An exceedingly versatile and efficient machine.

THE EDMANDS CO., 228 ABORN STREET PROVIDENCE 3, R. I.

MODERN, EFFICIENT LOOMS for Making WIRE FLY SCREENS

TYPE No. 239

Made in 36" and 48" widths:

(Shown at right)

TYPE No. 239-360

Made in 60" and 72" widths:

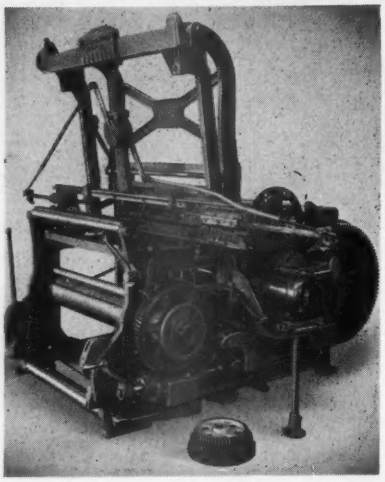
These larger looms have stronger frames and heavier construction throughout.

The take-up and screen tension of the 60" and 72" widths, is effected through a ratchet, instead of the usual worm gear and weight arrangement.

Speed changes of the loom are made by changing different sizes of the motor drive pinions.

On the 48" width and wider, extension slides are provided to support and guide the longer shuttle bars.

Steel shell warp drums are used.



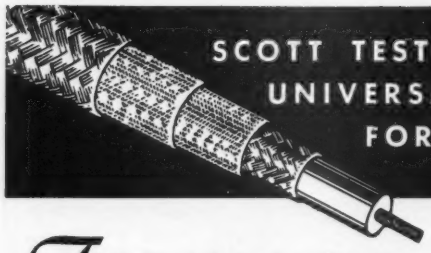
All looms are provided with an electric stop, which instantly stops the machine when either a warp or a cross wire breaks. All looms are motor driven.

We also make four heavier types.

write for details on this or other type looms you may need

MUMMERT-DIXON CO.

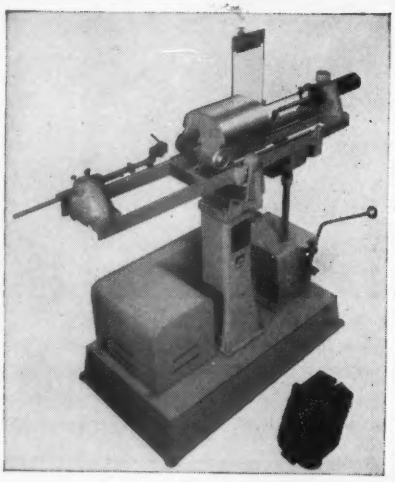
HANOVER 3, PENNSYLVANIA



SCOTT TESTERS HAVE UNIVERSAL APPLICATIONS FOR WIRE

1 P-4 SERIGRAPH

THE wire industry is well aware of the exacting precision of Scott Testers* for torsion and tensile and elongation tests of wires. But are you also aware of the application of our numerous machines for authoritative testing of jacket materials: textiles, rubber, plastics, glass fibres, etc., for both tensile and compression cutting . . . up to 2,000 lbs. tensile?



Model IP-4 Serigraph for tensile and hysteresis tests from grams to 50 lbs.

Request Literature stating your problem

SCOTT TESTERS, INC.

55 Blackstone St., Providence, R. I.

Scott Testers — Standard of the World

Control of Wire Draft: An Experimental Pulling-Power Gauge

(*Continued from page* 1025)

further advantage. The starting up of the wire-drawing machine at high velocities is materially facilitated. The injury to the wire is considerably reduced. Patents (German) of 1878 and of 1910 mention these advantages.

★ ★ ★

Much of this article is devoted to an analysis, mathematically and experimentally based, of the relation between the change in drawing power and change in the various effects of drawing, which seems to be pretty well established.

Catalog Issued on "Shaped Wire"

A 16-page illustrated catalog (DH-1226) describing ways of reducing machining costs with Page shaped wire has been issued by the **Page Steel & Wire Division** of **American Chain & Cable Company,** Monessen, Pa.

★ ★ ★

According to the booklet, these profiles are available in cross-sectional areas up to and including ¼-inch square, and in flats and rectangles in widths up to ⅜-inch —the ratio of width to thickness not exceeding 6 to 1. The wire is produced in low carbon, low alloy, high carbon and stainless steels, and in Armco ingot iron, in a wide range of commercial finishes.

★ ★ ★

Complete figures are given for calculating areas and weights of the more common shapes. Also included are physical properties charts, millimeter and hardness conversion tables, standard wire gages, and stock lists of carbon steels and stainless steels.

★ ★ ★

Some of the common uses for shaped wire are furniture stripping, grooves for sliding doors, grooved choke wires, valve stem key stock, oil retaining rings, snap rings, and lock spindles.

★ ★ ★

A copy of the catalog will be sent upon request to the company.

MIL-W-5086 WAS QUITE A PROBLEM

In fact it was three times a problem. We had to satisfy the Military Specification (which is MIL-W-5086). Then we had to satisfy the manufacturer of the wire. And finally there was the ultimate user of the wire who knew what he wanted —and demanded just that.

The story went like this:

MIL-W-5086 is a Military Specification covering aircraft electrical wire. To satisfy it our job was to develop a NELCO cable coating which would have abrasion resistance, fungus resistance, flexibility at temperatures as low as —55 degrees C. and, finally, be resistant to many liquids used in and around aircraft.

Specifically, the aircraft builder required the NELCO cable coating to withstand the hydraulic fluid that occasionally gets loose in a plane and causes serious damage to wire lacking a proper protective coating.

And, of course, the wire manufacturer had to have a cable coating which could be easily applied.

We turned this many sided problem over to our competent laboratory staff.

We don't say it was the same day they came up with the perfect cable coating but they did have it in a comparatively short time.

The above problem is typical of what our laboratory must face in preparing NELCO cable coatings for every conceivable condition.

Watch this column for more information on cable coating problems we have met and solved.

. . . and if you've found something of interest here, we'd like to hear from you.

Chemical Products
CORPORATION
King Philip Rd., East Providence, R. I.

Wire Drawing—Costing and Cost Control

(*Continued from page* 1024)

process. In the manufacture of products with many components, this correlation seldom exists to the same extent. One component might take a large amount of material, with very little labor, and might require a large automatic machine utilizing a great amount of overhead. Another component of the same product might require only a small amount of material with little overhead but a great deal of hand labor.

★ ★ ★

Thus although wire drawing presents definite problems in the treatment of annealing and die cost, particularly in a low volume operation, good overall cost control is possible through use of the daily production report, which will reflect drawing efficiency broken down by type of material drawn, by type of machine used, and by range of reduction which took place. The test of good control is whether or not the inefficiency is localized so that further study can be made. The daily production report meets this test for the wire drawing process.

"Fatigue of Aluminum"

This booklet contains the H. W. Gillette Memorial Lecture, presented before the 57th Annual Meeting of the **American Society for Testing Materials** last year, where it was presented by **R. L. Templin,** Chief Engineer of Tests, the **Aluminum Company of America.**

★ ★ ★

In this paper, Mr. Templin describes the phenomena of fatigue, gives the fundamental causes of fatigue failures, evaluates fatigue properties, covers factors affecting the fatigue strength of different aluminum alloys and goes into testing procedures. The paper is liberally illustrated with tables and graphs.

★ ★ ★

It contains 59 pages of material and may be secured from ASTM at 1916 Race Street, Philadelphia 3, Pa., at a price of $1.50 per copy.

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PORTER
Center-Cut
METAL CUTTER

Here's the tool for quick, efficient, easy cutting of medium hard wire and rods up to 5/8". Cuts anywhere! In the shop or on the job! Utilizes hand power only – exclusive toggle joint multiplies man power eighty times. In six different sizes and capacities.

Also available with rounded cutting edges for harder metals.

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Air Driven for Rapid Transfer of
ZINC
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ALUMINUM
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THEIR ALLOYS
and
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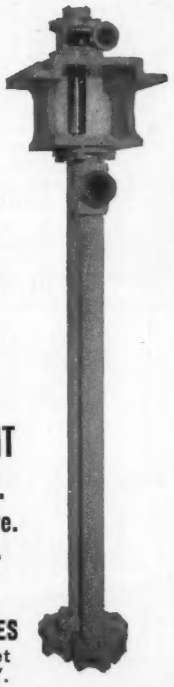

WIRE EQUIPMENT MFG. CO., INC.
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New York 17, N. Y.

COPPER COATING
WITH
CUPRODINE
IMPROVES
DRAWING

"Cuprodine" coats both carbon and stainless steels with a thin, bright, adherent layer of copper. This coating prolongs die life and improves the drawing of wire, rod and tubing.

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AMERICAN CHEMICAL PAINT CO.
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Use
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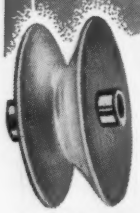

the NEW material that withstands hi-speed pressure of wire by the tons

HEANIUM®
IS THE BEST GUIDE
. . . TO LOW COSTS.

If guide wear is a problem in your mill . . .
try HEANIUM®

HEANY INDUSTRIAL CERAMIC CORP.
NEW HAVEN 3, CONNECTICUT

Processing Tungsten Wire for Incandescent Lamps

(*Continued from page* 1020)

exist. The so-called noble gases—argon, krypton, and xenon—are inert to tungsten at filament operating temperatures, and have decreasing conductivity and convection losses in the order named. Unfortunately, however, for incandescent-filament lamp use, they also have a decreasing ionization potential and are limited as to commercial availability in the same order. (The ionization potential of a gas is the voltage drop through which an electron must fall freely to remove an electron from the atoms. This is a necessary condition for rendering the gas conductive to the flow of electricity.) However, argon has largely displaced nitrogen as a gas filling in all but the higher voltage concentrated-filament lamps where arc-over tendencies are prevalent. Even so, it cannot be used in absolutely pure form but must be blended with nitrogen in various ratios, depending on the arc-over characteristics of the particular filament lamp design.

★ ★ ★

During the past few decades, lamp engineers have learned much about tungsten's idiosyncrasies and have applied their results to filament making—but there still remains room for improvements. Greater ductility, for example. A tungsten wire with greater hot-strength, and which will develop a stronger non-sag grain structure when burned in a lamp is also desirable. And although much time and effort have been devoted to the wire-drawing process, there is still opportunity to improve it to obtain better uniformity in diameter and ductility. Another possibility, of course, always lies in design improvement in the lamp and filament themselves, rather than specifically in the metal.

WRI To Meet In Fall

Frank R. Brown, Manager, Director of the Wire Reinforcement Institute, has announced that the Annual Fall Meeting has been set for October 31 and November 1 and 2, 1955 at the Inn, Ponte Vedra Beach, Fla.

Try the best!
WHITE WIRE LACQUER

CARBRO NO. 1017 has for many years been *the* outstanding Code Wire White Lacquer. It has never been surpassed for:

- **HIGH HIDING POWER**
- **EXCELLENT YARDAGE**
- **FAST, HIGH SPEED DRYING and**
- **REALLY BEING WHITE**

Write for details

CARBRO CHEMICAL CO.
PAWTUCKET, R. I.

Also
Mfrs. of flame-proof saturants, wire paints and lacquers, all colors. Finishes for all types of electric wires and cables.

FOR BETTER PRODUCTION

NATIONAL OFFERS YOU THREE SERVICES

- DIAMOND POWDER RECLAMATION — Exclusive process that gives maximum recovery. Send us your old cotton, die washings, worn wheels and sludge. High salvage percentages will pay you well.
- DIAMOND POWDERS—Complete line of graded quality powders for all lapping and finishing operations on wire drawing dies. First grades only.
- DIAMOND GRINDING WHEELS—A complete line of top-quality wheels for industrial production.

Write for prices.

NATIONAL RESEARCH COMPANY
25530 LITTLE MACK AVE.
ST. CLAIR SHORES, MICH.

A Modern Pickling and Surface Treatment Shop for Nickel Alloys and Stainless Steels

(*Continued from page* 1009)

for protection against hydrofluoric acid.

★ ★ ★

Figures 11 and 12 show two typical cases of these coating techniques which may be summarized as the mechanical protection of a slightly porous brick and an adherent plastic waterproof coating that is totally corrosion resistant.

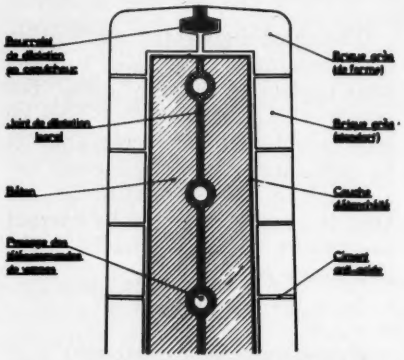

Fig. 11. Construction details of anti-acid protection for a common wall of adjoining tanks.

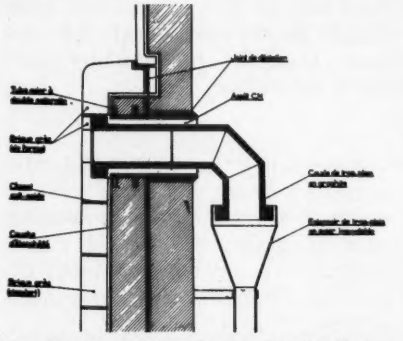

Fig. 12. Construction details of anti-acid protection for a tank wall placed against the gallery (overflow region).

★ ★ ★ ★ ★ ★

Nickel Alloys and Stainless Steels

Taking into consideration the severe conditions of liquid and atmospheric corrosion, nickel alloys and stainless steels have been necessary for numerous applications.

★ ★ ★

Monel has been chosen for lining the bottom of drying ovens that may be subjected to some acid drippings, as well as in the construction of the electrical switch-

CARBIDE NOZZLES
FOR EXTRUDING COATINGS
Onto Single and Multiple Conductor Wires
•
Let us tell you how to produce more wire before replacing nozzles.
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Write for Data
WIRE TOOL DIVISION
BRIDGEPORT JIG BORING CO.
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RECLAIMERS of
INDUSTRIAL DIAMOND POWDERS
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• COTTON WIPINGS • WIRE DIE POWDERS
ALL POWDERS GRADED TO U. S. GOV'T. BUREAU OF STANDARDS. SAMPLE SENT FREE.
Write or call for additional information

MUSIC WIRE and SPECIAL WIRES
Music Wire for Industrial Purposes
211 sizes Bright Polished, .0015" to .3437"
45 sizes Bright Tinned, .003" to .125"
Aluminum—Annealed—Belt Lacing—Brass, Soft and Spring—Copper, Bare and Tinned
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Monel—Nickel Silver—Pure Soft Nickel—Oil Tempered, Steel Spring, Black Finish
Phosphor Bronze, Spring Temper—Pure Iron Wire—Resistance Wire,
Hoskins Chromel "A"—Stainless, Soft and Spring Temper—Tag Wire, 1000 in an Envelope—Florist Wire—Spooled and Coiled, 1/4-1/2-1-5#
Wires Straightened and Cut to length—Small Gauges—Small orders our specialty
Wires and Strands for the fishermen. Trolling Wires, Copper-Monel-Stainless.
Leader Wires, "Wilstabrite" Stainless and "Silverbrite" Music.
THE MALIN & COMPANY
2514 Vestry Ave. Established in 1884 Cleveland 13, Ohio

REELS • SPOOLS
ALL SIZES
WOOD - PLYWOOD - WOOD - METAL
RETURNABLE NON-RETURNABLE
Samples and Prices on Request
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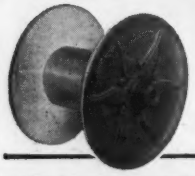
MILTON MACHINE

RUGGED in design... DEPENDABLE in service!

Save on replacement and maintenance!

RUGGED STEEL HEAVY DUTY PROCESSING REELS



Having trouble with light weight reels failing in heavy duty service? Send us a sketch or print stating the limiting dimensions and service required, we'll be glad to tell you about our facilities for supplying the wire rope and cable industry with special heavy duty processing reels, spools or bobbins. WRITE FOR BULLETIN 52-W.

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DESIGNERS – ENGINEERS – MANUFACTURERS
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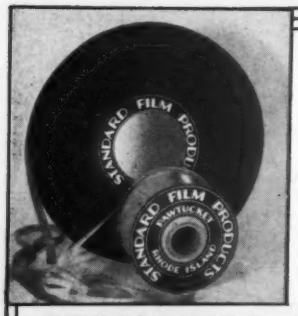

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board, the pyrometric cases and the signaling boxes.

★ ★ ★

316 Stainless Steel (18/10 with 2.5% Mo) was employed almost exclusively for the feeder tubes for tank fluids, of drainage pipes and ejectors, of overflow funnels, of blowing nozzles, of heating coils for nitric, sulfuric and alkaline baths, of pickling hooks and supports, of water and soda tanks, of drip pans between salt bath furnaces and quenching tanks and of slings and levers for handling tubes and bars.

★ ★ ★

The most important application still remains in a series of 12 hairpin hooks to handle coils, for which 316 steel was found to be best adapted, being acceptable as to cost and having universal resistance to corrosion, sufficient so that the same load may be carried to various successive baths without extra handling.

★ ★ ★

If the massive forged construction has been adopted for most of these pins, the lining of mild steel has, on the other hand, been found more economical for the ones specially affected by cold nitric solutions.

★ ★ ★

Corronel B, a Nickel-Molybdenum-Iron Alloy, has been used to equip feeder tubes and heating coils of tanks, which hold either hydrochloric or sulfuric acid, according to manufacturing contingencies.

★ ★ ★

Inconel, finally, as already said, has been used in the construction of the Ajax furnace electrodes on account of its excellent heat resisting properties.

Various Non-Metallic Materials

Among those that have been subject to special selection, we may mention:

—**Karbate graphite heat exchangers for heating nitro-hydrofluoric baths;**
—**Polyvinyl chloride for feeder tubes of these latter baths;**
—**Canada pitch-pine for all the wooden gratings and for the ventila-**

tion exhaust manifolds, resistance of the latter to corrosion having been further increased through creosote impregnation under vacuum;

—Special heat treated ebonite coating for the junction sheathing of the centrifugal fans;

—Highly corrosion-resisting paints with a chlorinated rubber base for the protection of travelling cranes, of all piping, of rinsing tanks, of ovens and of gallery walls, among others.

CONCLUSION

If the Tréfileries et Laminoirs de Précision Gilby-Fodor have attached particular importance to the equipment of these installations, it not is only for the purpose of increasing the production of nickel alloys and stainless steels. The growing diversity of the alloys produced and our desire to make top quality products also brought about the need for an exceptional pickling and surface treatment installation.

★ ★ ★

These operations play such a decisive role in the processing of products which are so difficult to cold work that the slightest shortcoming in their functioning cannot be tolerated.

★ ★ ★

To a large degree, they govern final product quality.

Improvement Policy at J & L's Wire Rope Plant Adds to Production Efficiency

(*Continued from page* 1012)

As in the case of the tubular stranders, many refinements also have been incorporated in the planetary machines.

★ ★ ★

Combined with ingenuity in the manufacturing process and innovations in the nature of the products—for example, a wire rope with a center which contains electrical thermocouples for determining temperature changes in grain storage bins—this plant is rapidly gaining a reputation as the most advanced wire rope facility in its field.

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Booklet Describes Waste Treatment of Cyanides, Chromic Acid

Processes for treating highly toxic cyanides and chromium compounds in industrial wastes are described in a booklet recently issued by **Fischer & Porter Company,** Hatboro 35, Pa.

★ ★ ★

By means of flow diagrams the 16-page booklet illustrates most common methods of treating cyanide and hexavalent chromium wastes and the applications of Fischer & Porter instrumentation for controlling the processes. Instruments used are illustrated and described.

★ ★ ★

The three basic systems for alkaline chlorination of cyanides and sulfonation of chromic acids—batch, continuous, and integrated—are described in detail. In all three systems, Fischer & Porter automatic control assures complete destruction of toxic wastes without using excessive quantities of treatment chemicals.

★ ★ ★

Also described and illustrated is the new integrated waste treatment system, developed by **Dr. Leslie Lancy,** an electroplating specialist and consultant to Fischer & Porter. The system saves about 75 percent of the cost of other plating waste treatment installations, needs no settling basins, ties into plating line without disrupting production, and maintains product quality.

★ ★ ★

As pointed out in the introduction, stream pollution has grown into a major problem as a result of the nation's gigantic industrial expansion. The booklet, Bulletin 90-242-10—available from Fischer & Porter Company on request.

New Wire Cloth Catalog

A new 15-page catalog is available which lists various kinds of industrial wire cloth in rolls and fabricated parts.

★ ★ ★

Wire cloth is defined, described and illustrated. Information in-

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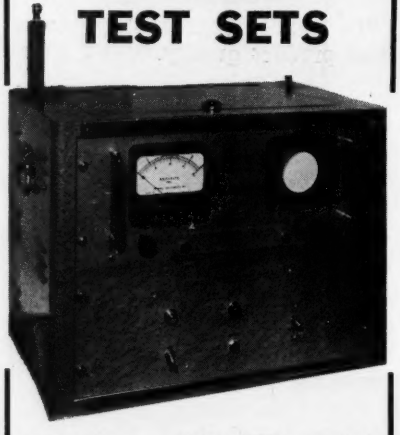
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★ ★ ★

Write The Pequot Wire Cloth Company, 35 Hoyt Street, Norwalk, Conn., for a copy.

Question And Answer Booklet On Electron Microscopes

A new 8-page booklet titled "Questions and Answers on Electron Microscopes" is available gratis from the Research and Control Instruments Division, **North American Philips Company, Inc.**, 750 Fulton Avenue, Mount Vernon, New York.

★ ★ ★

Text material was prepared specifically to answer questions that are frequently raised in the field concerning operation and application of these instruments.

★ ★ ★

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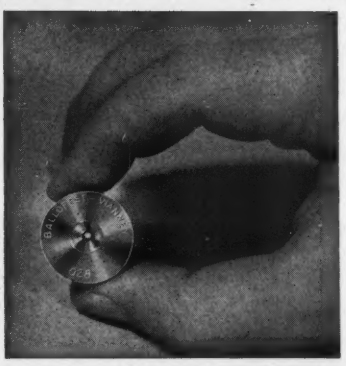
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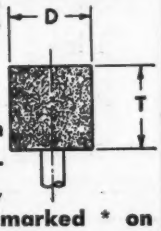

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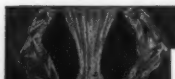

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The booklet explains such things as shadow casting, use of the same instrument for electron diffraction, resolution, visual and camera work, specimen preparation, negative and positive replicas, as well as electron and lens theory.

Cable and Accessory Information

New combination cable-tool and rotary well drilling machines, Helicopter hoisting, and transporting 4000 pound equipment, wire rope storage, new 40-foot yacht, a clay mine, dam project and new plastic coated cable are all shown in new bulletin **Ropeology** number 5535.

★ ★ ★

Published by **Macwhyte Company,** Wire Rope Manufacturers, Kenosha, Wisconsin. Free copy is available.

American Wheelabrator Announces Corporate Name Change

American Wheelabrator & Equipment Corp., Mishawaka, Indiana announces that it has changed its corporate name to **Wheelabrator Corporation,** effective immediately. The move does not involve any alteration in the ownership, management, or operation of the company, which manufactures blast cleaning equipment, dust and fume control equipment, and foundry equipment.

Carbide Engineers Attend Conference

Firth Sterling Inc. recently held a five-day conference for its seventeen carbide service engineers representing the company's nine districts. The conference emphasized the role of the service engineer in constantly improving customer service on both direct and distributor accounts.

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★ ★ ★

Other topics under discussion during sessions were: carbide grade selection and applications; steel mill practice and limitations; high speed and tool steel metallurgy; industry applications of steel; Method X, electro-mechanical removing of metal; the Thrift-tool, Firth Sterling's new low-cost throwaway mechanical tool; new carbide grades for steel milling, TXL and TXH; and the firm's new products designed for high temperature and corrosion resistance applications.

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Please do not reply unless you are a "shirt sleeve" operator with fine wire drawing and annealing experience. Must be aggressive and energetic with good knowledge of cold drawing production methods. Prefer Metallurgy Degree. Age 30-40.

Replies handled in strictest confidence, should include experience, education and present compensation. Our employees know of this ad.

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Gets Big SC Order

Davis-Standard Sales Corporation, Mystic, Connecticut, has announced receipt of a contract from the Signal Corps for delivery of more than a million dollars' worth of electric wire insulating machinery. This order, believed to be the largest ever issued for equipment of this kind, is for 44 complete wire insulating lines, from pay-off to take-up. No special equipment is involved—all machines in the line are to be standard items.

★ ★ ★

Issuance of this contract is regarded as indicating recognition on the part of the Signal Corps of the wide spread acceptance that Davis-Standard equipment has won in the electrical wire insulating industry. Much of the credit for this acceptance must go to **Benjamin Davis,** Vice President of the firm, whose familiarity with the problems of the industry is well known, and under whose direction the design of the present-day line of Davis-Standard wire machinery was evolved.

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Since the order involves only standard items of equipment, and since actual delivery to the Signal Corps is to be at the rate of only a few units per month, Davis-Standard will be able to maintain deliveries for their regular customers.

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MACHINERY—Closing Rope
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Watson Machine Co., Paterson, N. J.

MACHINERY—Coiling Rod
Vaughn Mach'y Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Cold Heading
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Copper Wire Drawing
American Insulating Mach'y Co., Phila., Pa.
National Mach'y Exch. (Used), New York.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Covering Wire (See MACHINERY—Insulating Wire)

MACHINERY—Cutting
Lewis Machine Co., The, Cleveland, Ohio
Mettler Machine Tool, Inc., New Haven, Conn.
Wells, Frank L., Co., Kenosha, Wis.

MACHINERY—Diameter Testing Continuous
Standard Electronic Research, New York, New York.

MACHINERY—Descaling Rod, Dry
Fisher Associates, New York, N. Y.
Herborn, Herborn, Germany.

MACHINERY—Die Making
Boulin, Victor J., Inc., New York, N. Y.
Carboloy Dept. General Electric Co., Detroit, Mich.
Dykrex Corp., Roos Tool & Mfg. Div., Newark, N. J.
Firth Sterling, Inc., Pittsburgh, Pa.
Wayne Wire Die Co., Hillside, N. J.

WHERE TO BUY, Continued

For more complete information, consult the annual Wire and Wire Products Buyers' Guide.

MACHINERY—Draw Benches
Morgan Construction Co., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Edging (See MACHINERY — Tandem Rolling and Edging Mills)

MACHINERY—Enameling
American Insulating Mach'y Co., Phila., Pa.
Cook Manufacturing Co., The, Paterson, N. J.
Industrial Ovens, Inc., Cleveland, Ohio
Michigan Ovens, Inc., Detroit, Michigan
Rockwell Co., W. S., Fairfield, Conn.

MACHINERY—Extruding
Davis-Standard Sales Corp., Mystic, Conn.
Entwistle, James L., Company, Providence, R. I.
Modern Plastic Machinery Co., Lodi, N. J.
Royle, John, & Sons, Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Fence
Blashill and Company, Arthur, Worcester, Mass.
Glader, Wm., Machine Works, Chicago, Ill.
Interlocking Fence Co., Morton, Ill.

MACHINERY—Flat Wire
Fenn Manufacturing Co., Newington, Conn.
Mettler Machine Tool, Inc., New Haven, Conn.
Rockwell, W. S., Company, Fairfield, Conn.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Forming Wire
Baird Machine Co., Stratford, Conn.
Nilson, A. H., Machine Co., Bridgeport, Conn.
Wafios, Maschinenfabrik, Reutlingen, Wurtt., Germany

MACHINERY—Galvanizing Wire
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wilson, Lee, Engr. Co., Cleveland, Ohio

MACHINERY—Gang Winders
Entwistle, Jas. L. Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Norton Co., The, Worcester, Mass.

MACHINERY—Insulating Wire
American Insulating Mach'y Co., Phila., Pa.
Davis-Standard Sales Corp., Mystic, Conn.
Fidelity Machine Co., Inc., Philadelphia, Pa.
Michigan Ovens, Inc., Detroit, Michigan
Modern Plastic Machinery Company, Lodi, N. J.
New England Butt Co., Providence, R. I.
Pourtier Pere et Fils, Romainville (Seine), France
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Wardwell Braiding Mach. Co., Central Falls, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Knitting
Fidelity Machine Co., Inc., Philadelphia, Pa.

MACHINERY—Lacquering Electric Wire
American Insulating Mach'y Co., Philadelphia.
Cook Mfg. Co., The, Paterson, N. J.
Industrial Ovens, Inc., Cleveland, O.
Michigan Ovens, Inc., Detroit, Michigan

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Looms, Wire Weaving
Interlocking Fence Co., Morton, Ill.
Mummert-Dixon Co., Hanover, Pa.
Wafios, Maschinenfabrik, Reutlingen, Wurtt., Germany

MACHINERY—Material Handling
(See Material Handling Equipment)

MACHINERY—Measuring Wire & Cable
Davis Electric Company, Wallingford, Conn.
Durant Mfg. Co., Milwaukee, Wis.
Entwistle, James L., Company, Providence, R. I.
New England Butt Co., Providence, R. I.
Standard Mill Supply Co., Pawtucket, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail and Tack
Baird Machine Co., The Stratford, Conn.
Glader, Wm., Machine Works, Chicago, Ill.
National Mach'y Exch. (Used), New York, N. Y.
Seybold Transworld Exporters, New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Wafios, Maschinenfabrik, Reutlingen, Wurtt., Germany

MACHINERY—Packaging Wire
Coulter & McKenzie Machine Co., Bridgeport, Conn.

MACHINERY—Pickling
Lewis Welding & Engineering Corp., The, Bedford, Ohio
Youngstown Welding & Eng'g Co., Youngstown, Ohio.

MACHINERY—Pin Making
Baird Machine Co., The, Stratford, Conn.

MACHINERY—Pointing
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury Conn.

MACHINERY—Poultry Wire Fencing
Interlocking Fence Co., Morton, Ill.

MACHINERY—Pumps for Molten Metal
Wire Equipment Mfg. Co., Trenton, N. J.

MACHINERY—Re-Spooling
Boyd & Sons Manufacturing Corp., Philadelphia, Pa.
Davis Electric Company, Wallingford, Conn.
Emory, Robert J., Co., Newark, N. J.
Federal Manufacturing Co., Wallingford, Conn.
Mummert-Dixon Co., Hanover, Pa.
National Mach'y Exch. (Used), New York.
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson, N. J.
Wire Equipment Mfg. Co., Trenton, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Rod Mill
Fenn Manufacturing Co., Newington, Conn.
Morgan Construction Co., Worcester, Mass.
Schumag Schumacher Metallwerke, Aachen, Germany

MACHINERY—Rolling Mill
Fenn Manufacturing Co., Newington, Conn.
Morgan Construction Co., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Rubber Insulating
Davis-Standard Sales Corp., Mystic, Conn.
Modern Plastic Machinery Co., Lodi, N. J.
Royle, John & Sons, Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Serving
Fidelity Machine Co., Phila., Pa.
Pourtier Pere et Fils, Romainville (Seine), France
Wardwell Braiding Machine Co., Central Falls, R. I.

MACHINERY—Spark Testing
Davis Electric Company, Wallingford, Conn.
Entwistle, James L., Company, Providence, R. I.
Federal Manufacturing Co., Wallingford, Conn.
Modern Plastic Machinery Co., Lodi, N. J.
Peschel Electronics, Inc., New Rochelle, N. Y.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Spring Making
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Wafios, Maschinenfabrik, Reutlingen, Wurtt., Germany
Wells, Frank L., Co., Kenosha, Wisc.

MACHINERY—Staple
Nilson, A. H. Machine Co., Bridgeport, Conn.
Seybold Transworld Exporters, New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Wafios, Maschinenfabrik, Reutlingen, Wurtt., Germany

MACHINERY—Straightening & Cutting
Continental Fdy & Machine Co., Medart Division, Pittsburgh, Pa.
Lewis Machine Co., The, Cleveland, Ohio
Mettler Machine Tool Co., New Haven, Conn.
National Mach'y Exch. (Used), New York, N. Y.
Wells, Frank L., Co., Kenosha, Wisc.

MACHINERY—Stranding
Haskell-Dawes Machine Co., Philadelphia, Pa.
Milton Machine Works, Inc., Milton, Pa.
New England Butt Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Swaging
Fenn Manufacturing Co., Newington, Conn.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Take-Up and Pay-Out
American Insulating Mach'y Co., Phila., Pa.
Blashill and Company, Arthur, Worcester, Mass.
Davis Electric Company, Wallingford, Conn.
Davis-Standard Sales Corp., Mystic, Conn.
Entwistle, James L., Company, Providence, R. I.
Federal Manufacturing Co., Wallingford, Ohio
Fenn Manufacturing Co., Newington, Conn.
Industrial Ovens, Inc., Cleveland, Ohio
Modern Plastic Machinery Co., Lodi, N. J.
New York Engineering Co., Yonkers, N. Y.
Standard Mill Supply Co., Pawtucket, R. I.
Watson Machine Co., Paterson, N. J.
Wire Equipment Mfg. Co., Trenton, N. J.

MACHINERY—Taping
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Pourtier Pere et Fils, Romainville (Seine), France
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Testing Magnet Wire Coatings for Pin Holes
Federal Manufacturing Co., Wallingford, Ohio
Peschel Electronics, Inc., New Rochelle, N. Y.

MACHINERY—Testing, Physical
Scott Testers, Inc., Providence, R. I.

MACHINERY—Tinning Wire
American Insulating Mach'y Co., Phila., Pa.
Cook Manufacturing Co., The, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y Co., Phila., Pa.

MACHINERY—Trolley Wire
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill, Cold Drawing
Mettler Machine Tool, Inc., New Haven, Conn.

MACHINERY—Turks Head
Fenn Manufacturing Co., Newington, Conn.

MACHINERY—Twinning
(See Mach.—Bunching)

MACHINERY—Twisters, Wire
Cook Manufacturing Co., The, Paterson, N. J.
Davis Electric Company, Wallingford, Conn.
Edmands Company, The, Providence, R. I.
Haskell-Dawes Machine Co., Philadelphia, Pa.

MACHINERY—Used
National Machinery Exchange, New York, N. Y.
Wire & Textile Machy., Inc., Pawtucket, R. I.

MACHINERY—for Wire Welding
(See WELDERS—Butt and Spot)

WHERE TO BUY, Continued

For more complete information, consult the annual Wire and Wire Products Buyers' Guide.

MACHINERY—Winding Wire
Emory, Robert J., Newark, N. J.
Entwistle, James L., Company, Providence, R. I.
Fenn Manufacturing Co., Newington, Conn.
Mummert-Dixon Co., Hanover, Pa.
New England Butt Co., Providence, R. I.
Standard Mill Supply Co., Pawtucket, R. I.
Watson Machine Co., Paterson, N. J.
Wire Equipment Mfg. Co., Trenton, N. J.

MACHINERY—Wire Drawing
Cook Manufacturing Co., The, Paterson, N. J.
Coulter & McKenzie Machine Co., Bridgeport, Conn.
Fenn Manufacturing Co., Newington, Conn.
Herborn, Herborn, Germany
Morgan Construction Co., Worcester, Mass.
Morgardshammers Mek Verstads AB, Morgardshammer, Sweden
National Mach'y Exch. (Used), New York, N. Y.
Schumag Schumacher Metallwerke, Aachen, Germany
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, Ohio
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Wire Forming
Baird Machine Co., The, Stratford, Conn.
National Mach'y Exch. (Used), New York, N. Y.
Nilson, A. H. Machine Co., Bridgeport, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Wire Rope
Milton Machine Works, Inc., Milton, Pa.
New England Butt Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Watson Machine Co., Paterson, N. J.

MACHINERY—Wrapping with Paper
Larmuth (1947) Ltd., Swinton, England
Terkelsen Machine Co., Boston, Mass.

MATERIAL HANDLING EQUIPMENT—
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

NAIL TOOLING—Tungsten Carbide
Firth Sterling, Inc., Pittsburgh, Pa.
Pittsburgh Carbide Die Co., Monongahela, Pa.

NAILS—Wire
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Sheffield Steel Corp., Kansas City, Mo.
Wickwire Brothers, Inc., Cortland, N. Y.

NIPPERS—Wire Cutting
Robinson, M. W. Co., Rockfall, Conn.

NOZZLES—For Extruding Machines
Wire Tool Div., Bridgeport Jig Boring Co., Bridgeport, Conn.

OVENS—Cable Lacquering and Enameling
American Insulating Mach'y Co., Phila., Pa.
Carl-Mayer Corp., The, Cleveland, Ohio
Industrial Ovens, Inc., Cleveland, Ohio
Michigan Ovens, Inc., Detroit, Michigan
Rockwell Co., W. S., Fairfield, Conn.

OVENS—Rod Bakers
Carl-Mayer Corp., The, Cleveland, Ohio

OVENS—Welding Rod Coating
Carl-Mayer Corp., The, Cleveland, Ohio
Industrial Ovens, Inc., Cleveland, Ohio

PAINT BONDING CHEMICALS—
American Chemical Paint Co., Ambler, Pa.

PAINTS—Heat Resisting
American Chemical Paint Co., Ambler, Pa.

PANS—Spelter, Galvanizing, Lead
National Annealing Box Co., Washington, Pa.

PAPER—Creped Wrapping
Arkell Safety Bag Company, New York, N. Y.
National Waterproof Papers, Inc., Beverly, N. J.
Terkelsen Machine Co., Boston, Mass.

PAPER—For Coil Wrapping and Corrosion Prevention
Arkell Safety Bag Company, New York, N. Y.
National Waterproof Papers, Inc., Beverly, N. J.
Terkelsen Machine Co., Boston, Mass.

PAPER—Insulating
Plymouth Cordage Co., Plymouth, Mass.

PATENT ATTORNEYS—
Lancaster, Allwine & Rommel, Washington, D. C.

PAY-OUT SYSTEMS—
(See MACHINERY—Take-Up & Pay-Out)

PHOSPHATE COATING CHEMICALS
(See COMPOUNDS—Phosphate Coating)

PICKLING COMPOUNDS—
See (Inhibitors—Pickling)

PICKLING—Hooks, etc. Acid Resisting
Lewis Welding and Engineering Corp., The, Bedford, Ohio
Youngstown Welding & Eng'g Co., Youngstown, Ohio

PICKLING TANK LININGS—
Chemsteel Construction Co., Inc., Pittsburgh, Pa.
Haveg Corp., Newark, Del.

PIPES & FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.

PLASTICIZERS—
Celanese Corporation of America, New York, N. Y.
Monsanto Chemical Co., St. Louis, Mo.
Naugatuck Chemical Div., U. S. Rubber Co., New York, N. Y.

PLASTICS—for Wire Insulation
Carbro Chemical Co., Pawtucket, R. I.
Celanese Corporation of America, New York, N. Y.
Electronic Rubber Co., Stamford, Conn.
Monsanto Chemical Co., St. Louis, Mo.
Naugatuck Chemical Div., U. S. Rubber Co., New York, N. Y.

POTS—Lacquer
Industrial Ovens, Inc., Cleveland, Ohio

POTS—Wire Tinning
National Annealing Box Co., Washington, Pa.

PULLERS AND GRIPS—For Wire
Morgan Construction Co., Worcester, Mass.
Scudder, E. J. Fdry. & Mach. Co., Trenton, N. J.
Sjogren Tool and Machine Co., Auburn, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, Ohio

PUMPS—Molten Metal
Fisher Associates, New York, N. Y.

REEL AND TENSION STANDS—
Davis Electric Company, Wallingford, Conn.
Fidelity Machine Company, Inc., Philadelphia
Industrial Ovens, Inc., Cleveland, Ohio.
New York Engineering Co., Yonkers, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Mill Supply Co., Pawtucket, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

REEL CRUTCHES—
Watson Machine Co., Paterson, N. J.

REELS & SPOOLS—Aluminum Alloy
Acrometal Products, Inc., Minneapolis, Minn.
Hubbard Spool Co., Garrett, Ind.
Milton Machine Works, Inc., Milton, Pa.
Wardwell Braiding Machine Co., Central Falls, R. I.

REELS & SPOOLS—Annealing and Stranding
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Garrett, Ind.
Milton Machine Works, Inc., Milton, Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Republic Steel Corp., Pressed Steel Div., Niles, Ohio

REELS—Metal Bound
Durkee Mfg. Co. Inc., Pine River, Minn.
Hubbard Spool Co., Garrett, Ind.
McCaskie, Inc., Wm., Westport, Mass.
Strand-Buffalo Corporation, North Tonawanda, N. Y.

REELS—Plywood
Carris Reels, Inc., Rutland, Vt.
Hubbard Spool Co., Garrett, Ind.
McCaskie, Inc., Wm., Westport, Mass.
Nelson Company, The, Baltimore, Md.
Strand-Buffalo Corporation, North Tonawanda, N. Y.

REELS & SPOOLS—Steel (All Types)
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Clark, J. L. Mfg. Co., Rockford, Ill.
Hubbard Spool Co., Garrett, Ind.
Mason Can Company, East Providence, R. I.
Milton Machine Works, Inc., Milton, Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New York Engineering Co., Yonkers, N. Y.
Republic Steel Corp., Pressed Steel Div., Niles, Ohio
Wardwell Braiding Machine Co., Central Falls, R. I.

REELS—Wire Mill
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg. Co., The, Hazardville, Conn.
Carris Reels, Inc., Rutland, Vt.
Durkee Mfg. Co. Inc., Pine River, Minn.
Hubbard Spool Co., Garrett, Ind.
Mason Can Company, East Providence, R. I.
McCaskie, Inc., Wm., Westport, Mass.
Mettler Machine Tool, Inc., New Haven, Conn.
Milton Machine Works, Inc., Milton, Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New York Engineering Co., Yonkers, N. Y.
Nilson, A. H. Machine Co., Bridgeport, Conn.
Republic Steel Corp., Pressed Steel Div., Niles, Ohio
Wardwell Braiding Machine Co., Central Falls, R. I.

REELS & SPOOLS—Wood
American Woodworking Co., Chicago, Ill.
Bridge Mfg. Co., The, Hazardville, Conn.
Carris Reels, Inc., Rutland, Vt.
Durkee Mfg. Co. Inc., Pine River, Minn.
Hubbard Spool Co., Garrett, Ind.
Nelson Company, The, Baltimore, Md.
Strand-Buffalo Corporation, North Tonawanda, N. Y.

REFRACTORIES—High Temperature
Norton Company, Worcester, Mass.

RETORTS—Annealing
National Annealing Box Co., Washington, Pa.

ROD BAKERS—
(See OVENS—Rod Bakers)

RODS—Stainless Steel
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Crucible Steel Co. of America, Pittsburgh, Pa.
Pittsburgh Steel Co., Pittsburgh, Pa.

RODS—Wire—Non-Ferrous
Chase Brass & Copper Co., Waterbury, Conn.
Kaiser Aluminum & Chemical Corp., Oakland, Calif.
Platt Bros. & Co., The, Waterbury, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Titan Metal Manufacturing Co., Bellefonte, Pa.

RODS—Steel
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Crucible Steel Co. of America, Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Sheffield Steel Corp., Kansas City, Mo.
Youngstown Sheet & Tube Co., Youngstown, O.

ROLLS—Wire Straightening
Lignum-Vitae Products Corp., Jersey City, N. J.

ROPE—Wire
Bethlehem Steel Co., Bethlehem, Pa.
Roebling's, John A. Sons Corp., Trenton, N. J.

RUST PROOF COMPOUNDS—
(See COMPOUNDS—Rust Preventing)

RUST REMOVING COMPOUNDS—
(See COMPOUNDS—Rust Preventing)

SATURANTS—Cable
Carbro Chemical Company, Pawtucket, R. I.

SATURATION SYSTEMS—
Industrial Ovens, Inc., Cleveland, Ohio
New York Engineering Co., Yonkers, N. Y.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

SHEAVES—Wood
Lignum-Vitae Products Corp., Jersey City, N. J.

SOAPS—Industrial and Wire Drawing
(See COMPOUNDS—Wire Drawing)

SPOOLS—(See Reels & Spools)

SPOOLS—Stamped Metal for Retail Wire Sales
Clark, J. L. Mfg. Co., Rockford, Ill.
Mason Can Co., East Providence, R. I.

STAMPINGS—Steel
Acrometal Products, Inc., Minneapolis, Minn.
Mossberg Pressed Steel Corp., Attleboro, Mass.

STRIP—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Roebling's, John A. Sons Corp., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

WHERE TO BUY, Continued

For more complete information, consult the annual Wire and Wire Products Buyers' Guide.

TANKS—Compound
National Annealing Box Co., Washington, Pa.
New York Engineering Co., Yonkers, N. Y.
Watson Machine Co., Paterson, N. J.

TANKS—Pickling and Plating
Chemsteel Construction Co., Inc., Pittsburgh, Pa.
National Annealing Box Co., Washington, Pa.

TESTERS — INSULATION
(See MACHINERY—Spark Testers)

TESTING EQUIPMENT
(See MACHINERY Testing, Physical and Diameter Testing)

TINSEL—Electric Conductor
Kassel Export Company, New York, N. Y.
Montgomery Co., The, Windsor Locks, Conn.

TINSEL WIRE—Resistance, Lame, Decorative Cords Thread—Bare Copper, Silver and False Gold Coated, etc.
(See TINSEL—Electric Conductor)

TOOLS—Nail Machine
Pittsburgh Carbide Die Co., Monongahela, Pa.
Wire Equipment Mfg. Co., Trenton, N. J.

TOOLS—Wire Cutting
Porter, H. K. Inc., Somerville, Mass.

TOOLS—Spring Forming, Carbide
Crafts, Arthur A., Company, Inc., Boston, Mass.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

TRANSMISSIONS—Variable speed (See Machy—Power Transmission)

TRAVERSES & DRUMS—For Reels
(See Drums & Traverses)

TRAVERSE MECHANISMS—
Apco Mossberg Co., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

VALVES & FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.

VARNISHES & LACQUERS—for Electric Wire
Carbro Chemical Co., Pawtucket, R. I.
Chemical Products Co., E. Providence, R. I.

VULCANIZING PANS AND EQUIPMENT—
American Insulating Mach'y Co., Phila., Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.

WELDERS—Spot and Butt
Micro Products Co., Chicago, Ill.

WIRE—Aluminum
Kaiser Aluminum & Chemical Corp., Oakland, Calif.
Malin & Co., The, Cleveland, Ohio
National Standard Company, Niles, Mich.
Scovill Mfg. Co., Waterbury, Conn.

WIRE—Barbed
Interlocking Fence Co., Morton, Ill.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.

WIRE—Brass and Bronze
Chase Brass & Copper Co., Waterbury, Conn.
Jury's Wire Products, Inc., Bloomfield, N. J.
Scovill Mfg. Co., Waterbury, Conn.
Spencer Wire Corp., Union, N. J.
Titan Metal Manufacturing Co., Bellefonte, Pa.

WIRE—Brush
Spencer Wire Corp., Union, N. J.

WIRE—Bunched & Stranded, Copper
Camden Wire Co., Camden, N. Y.
Utica Wire Corp., Derby, Conn.

WIRE—Cast
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Cold Heading
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Camden Wire Co., Camden, N. Y.
Chase Brass & Copper Co., Waterbury, Conn.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind
Crucible Steel Co. of America, Pittsburgh, Pa.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Kaiser Aluminum & Chemical Corp., Oakland, Calif.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Scovill Mfg. Co., Waterbury, Conn.
Sheffield Steel Corp., Kansas City, Mo.
Titan Metal Manufacturing Co., Bellefonte, Pa.
Wickwire Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Copper
Camden Wire Co., Inc., Camden, N. Y.
Chase Brass & Copper Co., Waterbury, Conn.
Jury's Wire Products, Inc., Bloomfield, N. J.
Spencer Wire Corp., Union, N. J.
Utica Wire Corp., Derby, Conn.

WIRE—For Electrical Conductors
Camden Wire Co., Camden, N. Y.
Kaiser Aluminum & Chemical Corp., Oakland, Calif.

WIRE—Flat, Fine
Kassel Export Co., New York, N. Y.
Montgomery Co., The, Windsor Locks, Conn.

WIRE—Galvanized
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
National Standard Company, Niles, Mich.
Roebling's, John A. Sons Corp., Trenton, N. J.
Sheffield Steel Corp., Kansas City, Mo.
Wickwire Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Magnet
Kassel Export Company, New York, N. Y.

WIRE—Manufacturers
Alloy Metal Wire Div., H. K. Porter Company, Inc., Prospect Park, Pa.
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Chase Brass & Copper Co., Waterbury, Conn.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Crucible Steel Co. of America, Pittsburgh, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Kaiser Aluminum & Chemical Corp., Oakland, Calif.
Keystone Steel & Wire Co., Peoria, Ill.
National Lock Washer Company, The, Newark, N. J.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A., Sons Corp., Trenton, N. J.
Scovill Mfg. Co., Waterbury, Conn.
Sheffield Steel Corp., Kansas City, Mo.
Spencer Wire Corp., Union, N. J.
Titan Metal Manufacturing Co., Bellefonte, Pa.
U. S. Steel Corp., N. Y., N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Molybdenum
Kassel Export Company, New York, N. Y.

WIRE—Music
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Kassel Export Co., New York, N. Y.
Malin & Co., The, Cleveland, Ohio
Spencer Wire Corp., Union, N. J.

WIRE—Nickel Silver and Phosphor Bronze
Alloy Metal Wire Div., H. K. Porter Co., Inc., Pittsburgh, Pa.
Chase Brass & Copper Co., Waterbury, Conn.
Malin & Co., The, Cleveland, Ohio
Titan Metal Manufacturing Co., Bellefonte, Pa.

WIRE—Oil Tempered
Crucible Steel Co. of America, Pittsburgh, Pa.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A., Sons Corp., Trenton, N. J.
Sheffield Steel Corp., Kansas City, Mo.

WIRE—Silver Plated Copper
Camden Wire Co., Camden, N. Y.
Kassel Export Co., New York, N. Y.

WIRE—Special Shapes
Alloy Metal Wire Div., H. K. Porter Co., Inc., Pittsburgh, Pa.
Continental Steel Corp., Kokomo, Ind.
Crucible Steel Co. of America, Pittsburgh, Pa.
National Lock Washer Company, The, Newark, N. J.
Titan Metal Manufacturing Co., Bellefonte, Pa.

WIRE—Spring
Alloy Metal Wire Div., H. K. Porter Co., Inc., Pittsburgh, Pa.
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Crucible Steel Co. of America, Pittsburgh, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
National Standard Company, Niles, Mich.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A., Sons Corp., Trenton, N. J.
Sheffield Steel Corp., Kansas City, Mo.
Wickwire Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Stainless Steel
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Crucible Steel Co. of America, Pittsburgh, Pa.
Firth Sterling, Inc., Pittsburgh, Pa.
National Lock Washer Company, The, Newark, N. J.
National Standard Company, Niles, Mich.
Pittsburgh Steel Co., Pittsburgh, Pa.

WIRE—Steel—Also Coppered and Galvanized Steel
Alloy Metal Wire Div., H. K. Porter Co., Inc., Pittsburgh, Pa.
American Steel & Wire Div., United States Steel Corp., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Crucible Steel Co. of America, Pittsburgh, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Jury's Wire Products, Inc., Bloomfield, N. J.
Keystone Steel & Wire Co., Peoria, Ill.
National Standard Company, Niles, Mich.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A., Sons Corp., Trenton, N. J.
Sheffield Steel Corp., Kansas City, Mo.
Spencer Wire Corp., Union, N. J.
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O

WIRE—Straightening and Cutting
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Tinned Copper
Camden Wire Co., Camden, N. Y.
Jury's Wire Products, Inc., Bloomfield, N. J.
Kassel Export Co., New York, N. Y.
Spencer Wire Corporation, Union, New Jersey
Utica Wire Corp., Derby, Conn.

WIRE—Tungsten
Kassel Export Company, New York, N. Y.

WIRE—Zinc
Platt Bros. & Co., The, Waterbury, Conn.

WOOD—for Guide, Rolls, Bushings, Wear Parts, etc.
Lignum-Vitae Products Corp., Jersey City, N. J.

WRAPPING PAPER—Creped
(See PAPER—Creped Wrapping)

YARNS & TAPES—Insulating
Celanese Corporation of America, New York, N. Y.
Pittsburgh Plate Glass Company, Pittsburgh, Pa.
Standard Film Products Corp., Pawtucket, R. I.
Synthetic Thread Corporation, Bethlehem, Pa.

YARN TESTERS—
Scott Testers, Inc., Providence, R. I.

The WATSON MACHINE COMPANY

ESTABLISHED 1845

PATERSON 3, NEW JERSEY, U. S. A.

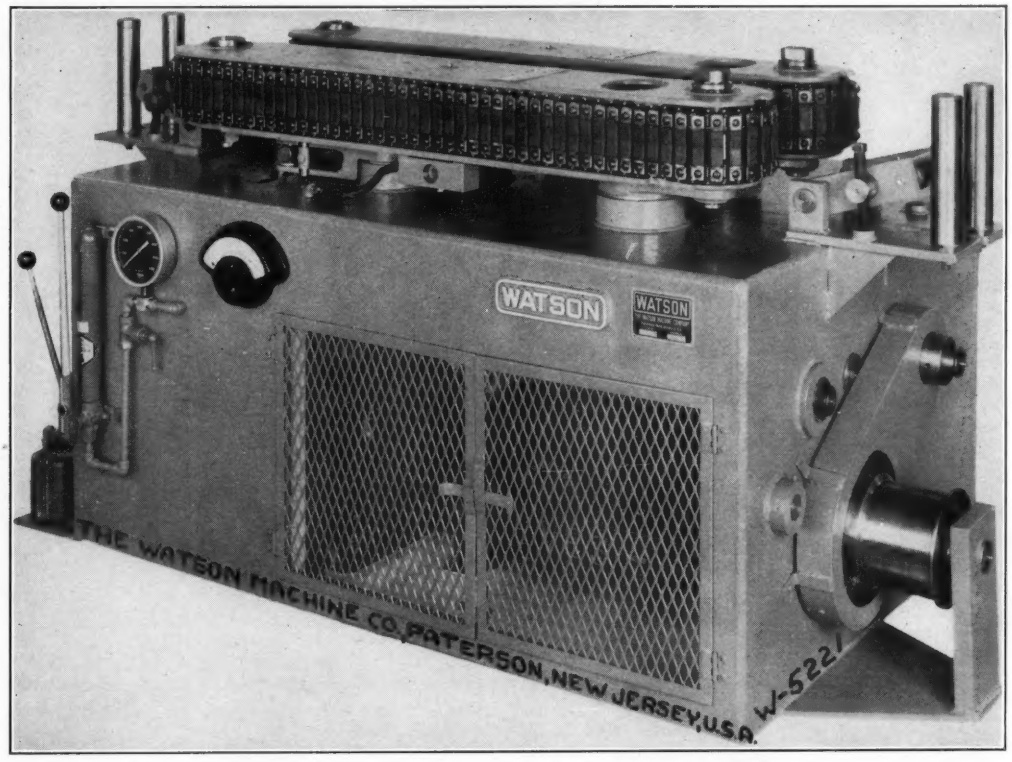
ELECTRICAL WIRE AND CABLE, WIRE ROPE, CORDAGE
AND MASTICATING MACHINERY MANUFACTURERS

WATSON

TRACTOR CAPSTANS

TWENTY YEARS EXPERIENCE IN THE DESIGN AND CONSTRUCTION OF TRACTOR CAPSTANS ENABLES US TO OFFER THIS LATEST MODEL, WHICH IS NOT ONLY SUITABLE FOR HAULING PAPER TAPED AND OTHER FIRM SURFACED CABLES AND PRODUCTS WITHOUT BENDS, BUT ALSO FOR UNCURED RUBBER CABLES.

SOME OF THE MORE OUTSTANDING FEATURES AND ADVANTAGES ARE: COMPACTNESS AND SIMPLICITY OF DESIGN — INTERCHANGEABLE TRACTOR FACINGS TO SUIT PRODUCT REQUIREMENTS — UNIFORM PRESSURE ON PRODUCT ALONG ENTIRE TRACK LENGTH — RAPIDITY OF ADJUSTMENT FOR SPEED, SIZE AND HAUL PULL VARIATIONS — SELF-POWERED OR LINE SHAFT DRIVE — STEPPED OR STEPLESS SPEED VARIATION.



No. W-5221 SHOWS A SELF-POWERED, REEVES DRIVEN UNIT CAPABLE OF HANDLING CABLES FROM 1" TO 6" DIAMETER, AT SPEEDS TO 30 F.P.M., AND EQUIPPED WITH LEAD WIRE PULL-IN WINCH.

9-55

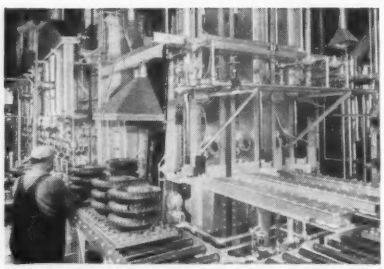
if you perform any of these operations

- Aging
- Annealing
- Aluminum Brazing
- Aluminizing Strip, etc.
- Billet Heating
- Brass Brazing
- Bright Annealing
- Bright Hardening
- Carbon Restoration
- Carbonitriding
- Carburizing, Gas, etc.
- Controlled Atmosphere
- Copper Brazing
- Enameling • Forging
- Galvanizing Strip, etc.
- Glass Heat Treating
- Hardening and Drawing
- Homogenizing
- Malleablizing
- Nitriding
- Normalizing
- Scale-Free Hardening
- Sintering
- Silver Soldering
- Special Atmosphere Treatments
- Spheroidizing
- Solution Heat Treating
- Strip Coating—Any Process
- Stress Relieving
- Quenching

there's an

EF PRODUCTION HEAT TREATING FURNACE

to fit your specific requirements



GAS CARBURIZING. This EF gas fired radiant tube gas carburizing unit with automatic quenching, washing and drawing equipment conveys gears and other material thru on three separate rows of trays. The special atmosphere is produced in an EF endothermic generator.

Backed by over 40 years of practical furnace building experience and thousands of successful fuel fired and electric furnace installations, EF engineers are in position to design and build just the size and type of equipment you need for handling any product or production, or for any heat treating or processing requirement.

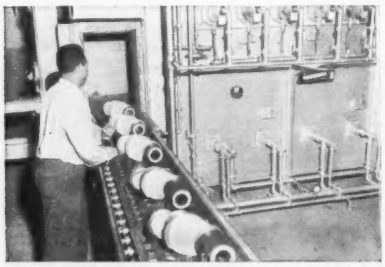
Submit your production furnace problems to experienced EF engineers — it pays.

THE ELECTRIC FURNACE CO.

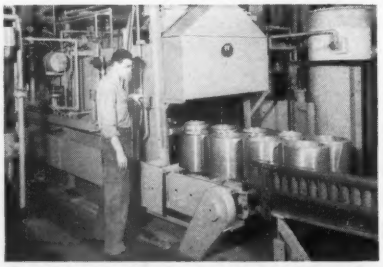
GAS FIRED, OIL FIRED AND ELECTRIC FURNACES FOR ANY PROCESS, PRODUCT OR PRODUCTION

Salem - Ohio

Canadian Associates • Canefco Limited • Toronto 1, Canada



SCALE FREE HEAT TREATING. This EF gas fired radiant tube installation with 3 heating zones, elevator type oil quench and a 2-station washing machine and rinsing equipment, scale free hardens heavy aircraft motor parts, uniformly, automatically and continuously.



UNIFORM ANNEALING. Brass, copper, aluminum, high and low carbon, stainless and other alloy strip, tubing and wire in coils, on reels or in strands, are uniformly annealed in hundreds of EF continuous and batch type furnaces. Our extensive experience can save you time and money.

BRIGHT ANNEALING. Discharge end of an EF gas fired radiant tube installation with EF endothermic special atmosphere generator for bright annealing various sizes of stampings, uniformly and continuously. Other EF installations are handling stainless steel and other stampings.